

DRAFT
WORKBOOK FOR THE DEVELOPMENT OF
CULTURAL RESOURCE ELEMENTS OF
FIRE MANAGEMENT PLANS

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1.0 BACKGROUND

The preservation of cultural resources is best served by facilitating a successful fire management program. This includes reducing administrative barriers that slow the rate or substantially increase the expense of fuel reduction. Fire management is not just another type of agency undertaking – it must become a comprehensive and continual land management practice to which cultural resource managers contribute. The thoughtful management of risk to cultural resources is a legitimate and necessary tool in facilitating fuel reduction to prevent uncontrolled wildland fires and the destruction of cultural resources. The fuels crisis on federal lands demands bold action. Timid avoidance of cultural resources is no longer an option, and we must be willing to make difficult choices that may risk some damage to cultural resources in the greater pursuit of their survival.

1.1 FEDERAL FIRE POLICY

The [Federal Wildland Fire Management Policy of 1995, as amended \(Federal Fire Policy\)](#) was developed and adopted by the Secretaries of Agriculture and Interior as the policy of their member agencies, including: the United States Forest Service (USFS); the National Park Service (NPS); the Bureau of Indian Affairs (BIA); the Bureau of Land Management (BLM); and the United States Fish and Wildlife Service (FWS) (Agencies). The Federal Fire Policy mandates the development of Fire Management Plans (FMPs) for every federal agency unit within agencies of the Departments of Agriculture and Interior (e.g., resource areas, national forests, national parks, wildlife refuges, BIA agencies) with burnable vegetation. Fire management decisions and actions are made within the planning context of the FMP for individual agency units. FMPs describe the application of various fire management practices to those specific land units, taking into consideration an array of environmental concerns, including the consideration of historic properties. Thoughtful fire management planning will benefit historic properties by: reducing the potential for catastrophic fires; integrating cultural resource consideration into wildfire suppression activities; and defining procedures for the protection of cultural resources from post-fire damage.

1.2 USE OF THIS WORKBOOK

This *Workbook for Cultural Resource Elements of Fire Management Planning* (workbook) offers assistance to federal agencies in preparing standard procedures for the consideration of cultural resources that may be affected by wildland fires and fire management activities. CREs are intended to support and derive from Fire Management Plans. In order to meet the goals of the Federal Fire Policy and federal agency responsibilities under [Section 106 of the National Historic Preservation Act](#), the Agencies have developed a [Programmatic Agreement on the Treatment of Historic Properties That May Be Affected by Fire Management Activities In Accordance With The Federal](#)

Wildland Fire Management Policy of 1995 (Fire PA). The Fire PA calls for the development of Cultural Resource Elements (CREs) of Fire Management Plans that describe the manner in which Agencies will identify and manage cultural resources in planning and implementing fire programs, including fuels management.

This workbook supports the [Fire PA](#), which emphasizes the development of [CREs](#). The Fire PA affords participating agencies the opportunity to craft their own procedures for managing cultural resources (identifying, evaluating, treating) during federal fire management activities. The procedures described in the CRE are negotiated with, and [reviewed](#) by the State Historic Preservation Officer(s) (SHPO) and/or Tribal Historic Preservation Officer(s) (THPO) relevant to the agency's geographic location. Once accepted by the SHPO/THPO, the federal agency may follow the cultural resource management procedures described in the CRE instead of those at [36 CFR 800.3-800.6](#) to satisfy its Section 106 responsibilities with regard to fire management activities. The CRE is the opportunity for agencies to tailor the cultural resource management process to their fire management needs to a much greater degree than is afforded by the standard Section 106 process. There are no strict limitations or specific prohibitions in the procedures that may be proposed in CREs. Procedures in CREs are negotiated to meet the needs of the agency, the SHPO/THPO, and public interests, taking into account the cultural values of [historic properties](#). Therefore, innovative approaches to historic preservation activities or the review process are encouraged. This document should be regarded as a source of ideas rather than prescriptions. These ideas and organizational approaches are based on the experiences of literally dozens of cultural resource specialists that have attended the National Park Service workshop "[Cultural Resource Protection and Fire Management Planning](#)" (see third column of web linked page). Several dozen cultural resource and fire management specialists from national parks all over the nation have attended the three-day workshop and shared management problems and solutions. The result is a growing body of approaches and examples to cultural resource management for a wide variety of fire management circumstances. This workshop, combined with the burgeoning literature on fire and its effects, have contributed to the development of these workbook .

All of the suggestions for developing CREs described herein are unlikely to meet the needs of all agency units. This workbook offers a series of planning tools that can be used selectively in different combinations and different order to meet individual agency planning and management needs.

We encourage agencies to use these workbook only to the extent that they provide assistance in planning and streamlining the cultural resources management process. Despite variations in CREs between agency units, however, there is basic information that should be included in CREs.

1.3 PLANNING HIERARCHY

1.3.1 Land and Resource Management Planning

For most federal agencies, land management is guided by planning documents such as Land and Resource Management Plans or General Management Plans. These documents guide the

types of land uses that are desired or allocated for various portions of the administrative unit, and they often identify constraints on use as well. Specific actions or undertakings should be consistent with the direction of the land management plan. Alternative land uses are often allowed, particularly if those uses are not incompatible with the desired condition or use specified in the land management plan. Other planning documents are often tiered to the general or land management plans to address specific types of land use and how they will be applied throughout the administrative unit, taking into account varying desired uses or emphases. Thus, an agency unit may develop plans to address recreation, silviculture, grazing, mining, plans, interpretive plans, and of course fire management plans.

1.3.2 Fire Management Plans

A FMP describes a specific, detailed fire program that most efficiently meets fire management direction based on the agency's land or resource management plan. It expands the direction offered in such plans into specific fire management direction that is associated with Fire Management Units (FMUs). FMUs are land management areas definable by objectives, topographic features, access, values-to-be-protected, political boundaries, fuel types, or major fire regimes, etc., that sets it apart from management characteristics of an adjacent unit. The FMP is supplemented by operational procedures such as preparedness plans, preplanned dispatch plans, prescribed fire plans and prevention plans.

Clearly defined fire management goals, objectives, and actions are developed and updated in comprehensive Fire Management Plans. Fire Management Plans must be consistent with firefighter and public safety, values to be protected, and land and resource management plans and must address public health issues. Fire Management Plans must also address all potential wildland fire occurrences and include the full range of fire management actions.

In addition, FMPs should directly relate to Cultural Resource Management Plans (CRMPs) developed for Agency Units. Such CRMPs may be: incorporated in general Land and Resource Management Plans; developed separately for an Agency Unit or district; apply to a National Register of Historic Places District; apply to a specific historic property; or a combination of the above.

The development of FMPs is guided by an interagency template produced by the National Interagency Fire Center. National Park Service guidance for FMPs is found in [Reference Manual \(RM\) 18, Chapter Four](#). The U.S.D.A. Forest Service guidance for FMP development is found in the [Forest Service Handbook \(FSH\) 5109.19-Fire Management Analysis and Planning Handbook, Chapter 50 – Fire Management Planning](#). These documents are used and cited throughout this CRE workbook , as appropriate.

1.3.3 Cultural Resource Elements

CREs describe the protocols that must be followed with regard to cultural resources in administering the fire program. CREs should define, based on existing information, how the agency will identify and consider important cultural resources when planning and implementing fire management activities. These protocols should take into account the fire management objectives for each FMU, which should in turn derive from the agency's land or resource management plan. Therefore, fire management objectives and considerations can affect the direction of cultural resource management. A specific cultural resource that might be

afforded protection in one FMU might be left unmanaged in another FMU. Further discussion and examples of the CRE relationships to FMUs and FMPs is offered later in this guidance.

Cultural Resource Elements (CREs) are not prepared in a vacuum. They should flow down from more comprehensive plans that define how the agency intends to manage the lands that it administers. As such CREs are support documents that describe for agency fire programs how fire must be used or controlled to enhance or protect cultural resources. Following is a brief description of this tiered planning process and the relationship of CREs to that process.

Section IIIA of the [Fire PA](#) calls for each Agency Unit to:

...develop a Cultural Resource Element to its FMP or fire management planning process. Cultural Resource Elements describe cultural resource management activities that will be applied to fire management undertakings to take into account historic properties during the planning and implementation of fire management undertakings.

1.3.4 Fire Program Areas

For the purpose of this CRE workbook, federal agency fire management is organized into three program areas: (1) Fuels Management Project Rehabilitation, which includes prescribed fire and mechanical fuels reduction; (2) Fire Suppression, which involves structurally organized responses to unscheduled wildland fires; and (3) Burned Area Emergency Stabilization and Rehabilitation (ESR), which include activities to minimize threats to life and property, including cultural resources, during and immediately following a wildfire.

A complete and comprehensive CRE should describe the manner in which the Agency Unit will identify, evaluate, and consider important cultural resources within the planning and implementation phases of each of these three fire management programs.

This workbook presents a series of general planning tools that may be adapted and applied to the management of cultural resources under various fire management program areas. The following basic information should be provided within the CRE. However, the information listed in the following outline should be rearranged or combined in ways that best meet individual agency unit needs. The descriptions that follow the recommended contents are general in nature, since the Fire PA affords considerable flexibility in the development and negotiation of specific CRE procedures between agency units and SHPOs/THPOs.

2.0 CONTENTS OF A CULTURAL RESOURCE ELEMENT

The length, detail, and nature of descriptions for the following topics will vary by agency unit according to: the size of the land area; the complexity of environments and fire management program; the nature of cultural resources; and the land use emphasis of the agency.

Accordingly, some of the topics may warrant passing reference for one agency unit, and extensive discussion for another. In addition, information may be separated or combined in different categories.

2.1 RELATIONSHIP OF CRE TO FMP

The CRE should include a brief description of how it relates to the FMP for the agency unit. This is an opportunity to identify the status of the FMP in terms of its age and any plans for updating or revision. Functional relationships between the FMP and CRE may also be described. For example, the FMP may include summaries of treatment measures extracted from the CRE, or it may simply reference the CRE.

2.2 SCOPE OF CRE

An explanation of the range of fire management activities and program areas that are discussed in the CRE should be included. This discussion should describe how the CRE should be used. For example, is the CRE process-oriented (i.e., it describes a process of study and decision-making), or does it provide the results of inventory and describe resource-specific treatment measures?

2.3 SUMMARY DESCRIPTION OF FIRE MANAGEMENT UNITS

Briefly describe how the agency unit is organized into FMUs and what those FMUs represent in terms of fire management emphasis. Describe the relationship of cultural resources and cultural resource management activities and FMUs, if any. For example, are historic contexts organized by geographic areas that align with FMUs, or do they cross-cut FMUs? Are any FMUs developed around the protection of cultural resources?

2.4 HISTORIC CONTEXTS OR BACKGROUND CULTURAL INFORMATION

Identify the prehistoric, historic, and contemporary cultural setting within the agency unit lands. This information should be extracted and summarized from existing reports, overviews, or syntheses. Include contemporary, traditional use of the agency lands by Indian tribes or other groups. These descriptions may or may not relate to FMUs, as appropriate.

2.5 TYPES OF CULTURAL RESOURCES

Background research and the identification of prehistoric, historic, and contemporary land use themes should result in the identification of specific types of cultural resources associated with those themes. Describe the known and/or suspected types of cultural resources within agency unit lands. It may be useful to organize cultural resource information by FMU, as long as it meets cultural resource and fire management needs.

2.6 CULTURAL RESOURCE VALUES

Specific cultural resources within an agency unit may be listed or determined eligible for inclusion on the National Register of Historic Places (historic properties). The number of such historic properties will depend on the size of the agency unit, the scope and scale of the cultural resources program, and the nature and abundance of cultural resources. Known historic properties may be few or many. If they are few, then it may be possible to individually name and summarize those properties (e.g., a small National Park dedicated to a specific historic event). If there are too many known historic properties to individually name and summarize, then this section of the CRE should at least enumerate historic properties by type and FMU. To the degree practical, identify the cultural value of the historic property with reference the NRHP criteria. A table format may be useful for this purpose.

Many agency units have received little professional cultural resources inventory, and often, much of the inventory is associated with land use projects tied to certain resources or resource areas. Consequently, there may be large areas devoid of inventory where land use projects do not occur (e.g., wilderness areas of National Forests). When there is little inventory and few known historic properties within portions of an agency unit's lands, background research should indicate general historic activities that occurred within those areas and the types of cultural resources that are likely to occur there. While less than ideal, the potential cultural values of such property types can be identified. Once values are defined, then the physical characteristics associated with those values can be identified, setting the stage for management.

2.7 DESIRED CONDITIONS

The desired condition that an agency identifies for historic properties or cultural resources may be stated in any of a variety of documents such as land management plans, resource management plans, cultural resource management plans, historic preservation plans, interpretive plans, and overviews, to name a few. These documents may not use the term "desired condition", but they may identify the cultural values and the physical conditions associated with those values that the agency wishes to maintain or achieve for cultural resources or cultural landscapes. Desired conditions may constitute the management goals and objectives to achieve with fire management.

2.8 STAFFING

Describe staffing levels and qualifications necessary to implement the CRE. Historic preservation activities may be conducted by qualified individuals in a variety of ways, including in-house staff, intra- and inter-agency details, cooperative agreements, or contracting.

2.9 PARTICIPATION OF INDIAN TRIBES AND THE PUBLIC

Consultation with Indian tribes and the public is an ongoing responsibility for individual fire management actions. The CRE must describe consultation procedures, including:

- identity of Indian tribes and the interested public;
- the timing of consultation;
- mechanisms of consultation;
- opportunities for comment;
- procedures for objection; and
- resolution of objections.

2.10 AGENCY REVIEW PROCEDURES

The CRE must describe the circumstances and process by which fire management undertakings will be reviewed by the SHPO/THPO and Council. The review process will be negotiated by each agency with the SHPO/THPO under the terms of the Fire PA. Review and consultation procedures may be described in a single section of the CRE or addressed by fire management program area, as appropriate to each agency.

Each CRE must include a provision for periodic review of the effectiveness of the CRE by the SHPO/THPO, with opportunities to comment by appropriate Indian tribes, the NCSHPO, and the Council. The review provision must also include procedures for revising the CRE to address noted deficiencies.

2.11 FUELS MANAGEMENT UNDERTAKINGS

Following are topics that should be addressed in a CRE section that describes the protocols for fuels management projects. Some of these standards may be applicable to all fire management program areas and placed in a CRE section that addresses these topics (e.g., professional qualification standards, consultation standards, unanticipated effects). Detailed discussion of cultural resource management protocols for fuels management projects is offered in the [*Workbook For The Development Of Cultural Resource Management Protocols For Fuels Management Projects*](#) (Jackson 2002a). The workbook may be adopted, adapted, or ignored to construct program-specific procedures within the CRE.

- Professional Qualifications. Describe the minimum qualifications necessary to

conduct historic preservation activities related to fuels management projects, consistent with the Secretary of Interior's Professional Qualification Standards or agency standards.

- Planning Protocols. Define the range of activities covered under fuels management, and the agency planning process, including the chain of authority and protocols for cultural resource specialist participation in planning fuels management projects. If the agency unit has an active program of public participation, technical or financial assistance to states or local communities, or cooperative fire management responsibilities, those programs should be identified and the manner in which the agency unit proposes to consider cultural resources in planning such activities should be described.
- Undertaking Information. Identify the information standards by which cultural resource specialists are consulted regarding fuels management undertakings, and the lead time that is afforded for historic preservation activities. Explain how areas of potential effects (APEs) will be defined.
- Records and Literature Research. Describe the standard sources of information that will be consulted in determining the current knowledge of cultural resources within proposed fuels management projects.
- Consultation with Indian Tribes and the Public. Describe the types of consultation that the agency will conduct throughout the planning process. This should include the amount of time that Native Americans and the interested public have to comment on proposed undertakings, methods of consultation, avenues for comment, procedures for responding to concerns, and a process by which to address objections or disputes.
- Identifying Cultural Resources. The methods of cultural resource inventory that will be conducted for various types of fuels management projects (i.e., prescribed fire, mechanical reduction), or the decision-making process by which inventory methods are developed must be described. The agency unit should consider taking advantage of economies of effort in conducting surveys for adjacent FMUs, when possible. Not only might there be savings in travel time, but conducting surveys of areas that cover multiple years of prescribed fires will provide a better inventory and a better context for understanding the nature, abundance and appropriate management of various resource types
- Evaluating Cultural Resources. The process and criteria for evaluation of cultural resources identified within APEs must be defined. The Fire PA provides flexibility in selectively evaluating resources or deferring evaluation, as long as a process for either protecting or identifying the values of cultural resources is developed and agreed to by the SHPO/THPO.
- Determining Effects. Describe the criteria and the process for determining the effects of fuels management projects on cultural resources. Are there thresholds

of effects below which limited impacts are acceptable? Describe how effects will be determined if protective measures are put into place.

- Treatment Measures. Describe the methods by which potential effects to cultural resources will be treated or considered. Describe standard treatment measures (if any), non-standard or experimental treatment measures, and the types and levels of, and entities involved in, review of such treatment measures prior to their implementation. Describe the criteria that will prompt SHPO/THPO review of treatment measures, if any.
- Monitoring. Monitoring is an essential activity for ensuring the success of treatment measures and testing assumptions. The CRE must describe when and how monitoring will take place for fuels management projects, including monitoring of fuels management activities as well as post-fire monitoring and post-fire survey, as appropriate.
- Experimentation. Continued experimentation is necessary to develop and refine our understanding of heat effects and methods of protection and treatment. The CRE should describe the process for determining the nature and scheduling of experiments.
- Unanticipated Effects. Excessive fuels can obscure cultural resources, and fire is not always controlled as well as anticipated. Despite best efforts, there will be occasional unanticipated effects, meaning that previously unidentified resources are impacted or there are unanticipated effects to known resources as a result of failure of treatment measures. The CRE should identify protocols for addressing such effects.
- Discoveries. Previously unidentified cultural resources may be exposed and discovered as a result of a fuels management project. The CRE should describe how discoveries will be.
- Agency Review Process. If not woven into the protocols listed above, the nature and frequency of review of proposed agency fuels management projects by the SHPO/THPO and any other entities (e.g., internal review) must be described in the CRE. Review periods and allowable actions in the absence of responses should be described.

2.12 FIRE SUPPRESSION

Guidance for the development of CRE protocols for considering cultural resources during fire suppression is offered in the [*Workbook For The Development Of Cultural Resource Management Protocols For Fire Suppression*](#) (Jackson 2002b). Those protocols may be used, in whole or in part, to develop the fire suppression section of the CRE.

- Professional Qualifications. Describe the minimum qualifications necessary to

conduct historic preservation activities related to fire suppression, consistent with the Secretary of Interior's Professional Qualification Standards or agency standards.

- Planning Protocols. Define the role of cultural resource specialists in fire suppression actions. This discussion should reference the role of the specialist in the Incident Command System. This topic of the fire suppression protocol should be the lengthiest, since it describes the activities that the cultural resource specialist conducts during fire suppression. The discussion of activities should include:
 - communication with, and notification of, cultural resource specialists during all phases of response to wildland fires;
 - notification of the SHPO/THPO of wildland fire suppression activities;
 - the role and responsibility of the cultural resource specialist on various fire suppression teams (Type I, II, and III teams);
 - responsibilities of the cultural resource specialist as a technical specialist or advisor to the incident command team during fire suppression.
- Consultation with Indian Tribes and the Public. Describe consultation procedures during fire suppression actions. This should include the manner in which Native Americans and the interested public can provide input regarding cultural resource concerns and how those concerns will be conveyed and considered by the incident command during suppression activities.
- Treatment Measures. Describe the methods by which potential effects to cultural resources might be treated or considered. Describe standard treatment measures (if any), non-standard or experimental treatment measures.
- Agency Review Process. If not woven into the protocols listed above, the nature and frequency of review of proposed agency fuels management projects by the SHPO/THPO and any other entities (e.g., internal review) must be described in the CRE. Review periods and reporting requirements should be described.

2.13 EMERGENCY STABILIZATION AND REHABILITATION

Guidance for the development of CRE protocols for considering cultural resources during emergency stabilization and rehabilitation is offered in the *Workbook For The Development Of Cultural Resource Management Protocols For Emergency Stabilization and Rehabilitation* (Jackson 2002c). Those protocols may be used, in whole or in part, to develop the fire suppression section of the CRE.

- Professional Qualifications. Describe the minimum qualifications necessary to

conduct historic preservation activities related to emergency stabilization and rehabilitation (ESR), consistent with the Secretary of Interior's Professional Qualification Standards or agency standards.

- ESR Mobilization and Command Structure. Describe how and when the ESR Team is mobilized to assess fire and suppression-related damage. Define the command structure under which the ESR Team operates.
- Planning Protocols. Define the role, responsibilities, and limitations of cultural resource specialists in ESR. This discussion should reference:
 - the role of the cultural resource specialist in the ESR Team;
 - restrictions or limitations placed on cultural resources specialists regarding survey of burned lands, criteria for site visits, and criteria for data collection. Allowable (i.e., funded) and disallowed cultural resources activities should be defined;
 - the phases of ESR work should be described (e.g., damage assessment, planning, and treatment;
 - ESR Plan contents;
- Consultation with Indian Tribes. Describe the consultation process with Indian Tribes in terms of timing and the identity of the Tribes.
- Evaluation. Describe the manner in which cultural resources will be evaluated prior to decisions regarding treatment. Evaluation may be with reference to the National Register of Historic Places or alternative criteria, if the SHPO/THPO agrees.
- Selecting Treatment Measures. The process and/or criteria by which treatment measures will be selected should be described.
- Consultation with the SHPO/THPO. The timing and nature of consultation with the SHPO/THPO must be described in the CRE.

2.14 INTERAGENCY SHARED SERVICES AND COLLABORATION

Federal agencies often share administrative boundaries or provide personnel and equipment for fire management activities to other agencies, particularly for wildland fire suppression. The FMP for the agency unit should describe the avenues for such shared services. The CRE should identify, to the extent possible, how cultural resource program activities will be coordinated between agencies and the protocols that will be followed to ensure that the provisions of each CRE will be followed.

2.15 STATE AND LOCAL ASSISTANCE

Federal agencies that provide funding, technical assistance, or services to states and local communities have a responsibility to consider cultural resources on lands to which that assistance will be provided. The CRE should provide a description of how cultural resources will be identified and considered under the provision of state or local assistance. Under the terms of the Fire PA, there is no inherent requirement to identify, evaluate, or protect all resources. However, state and local assistance programs should provide a mechanism for ensuring that cultural resources are given due consideration.

2.16 RELATIONSHIP OF THE CRE AND FMP TO HISTORIC PRESERVATION PROGRAMS

Agencies are responsible for complying with a variety of environmental and historic preservation laws other than Section 106. These include, among others, Section 110 of the NHPA, the Archaeological Resources Protection Act (ARPA), the Native American Graves Protection and Repatriation Act (NAGPRA), and the National Environmental Policy Act (NEPA). As relevant to individual agencies, the CRE should include a discussion of how its procedures will meet or contribute to compliance with other mandates.

3.0 BUILDING THE CULTURAL RESOURCE ELEMENT

3.1 SUMMARY STEPS IN THE CRE PLANNING PROCESS

Following is a summary of possible steps to follow in developing a Cultural Resource Element of a Fire Management Plan. Specific guidance for each of the categories in the outline below is provided later in this document. The steps outlined below should not be regarded as absolute or unalterable. The formats and emphasis of CREs and FMPs are likely to vary considerably according to agency needs and the nature of cultural resources. The following outline charts a logical series of steps, and many of the data needs and planning steps are fundamental to any planning effort, it is not the only way for all agencies to organize their CREs.

1. Early Planning
 - identify planning needs
 - identify your State Historic Preservation Officer (SHPO) and/or Tribal Historic Preservation Officer (THPO)
 - identify Native American groups and individuals and the interested public
 - identify Land or Resource Management Plan goals and objectives
 - identify Fire Management Plan goals and objectives
 - identify Fire Management Units and their strategic management objectives
2. Gather Data
 - collect existing inventory information
 - examine fire histories
 - consult with Indian tribes
3. Assess Data
 - determine whether data is adequate for planning purposes
 - identify additional information needs
 - consult with SHPO/THPO on nature of Cultural Resource Element
 - modify/adjust nature of Cultural Resource Element, as needed, in light of data limitations, opportunities, SHPO/THPO feedback
4. Organize Data
 - organize data in useful formats and media such as GIS, electronic databases, cross-referenced maps, etc.
 - identify historic contexts and prepare brief defining statements
 - identify and define property types associated with historic contexts
 - identify/define the cultural values associated with property types
 - identify/define the physical traits of property types that convey cultural values
 - identify/define the desired condition of property types
5. Assess Risk

- identify activities that may affect cultural resources
 - identify vulnerability of property types with reference to elements
 - determine whether various property types are resources at risk for each fire management activity
 - identify geographic areas and associated property types at risk, given fuel buildups and fire histories (e.g., FRID analysis)
 - use/develop fire sensitivity mapping
6. Select Treatment Measures
- identify fire management goals and objectives
 - consider measures for site avoidance (e.g., hand lines, wet lines, bulldozer lines, fire exclusion), protection measures (e.g., foam, fabric, removal of fuels, bury surface fuels, etc.), and fire control (burn prescriptions) for resource types
- select those measures which best achieve both fire management and cultural resource goals

3.2 SELECTING THE TYPE OF CULTURAL RESOURCE ELEMENT

Climate, vegetation, land forms, agency unit size and mission, and a host of other characteristics determine an agency unit's fire management needs and consequently their planning approach. Variations in these characteristics both within and between agency units of the five federal agencies participating in the Fire PA are substantial. Therefore, specific contents and standards for CREs will not apply to all agency units. For example, the cultural resource planning needs of a National Park of a few hundred acres of open grassland are very different than a mountainous National Forest of millions of acres covered by forested lands. Before launching into the development of a CRE, the agency should assess its planning needs and select a type of planning effort and planning document that will meet those needs. Agencies should scale the size and complexity of their CRE to meet their planning needs and use these CRE workbook selectively.

The federal fire management planning arena encompasses a mosaic of approaches. Some agencies and agency units have never prepared FMPs for lands under their jurisdiction, and their land managers do not intend to do so, regardless of departmental policy. Other agencies are embarking on their first FMP development effort, while others developed their plans years ago. Many of these old FMPs contain rather generic statements and platitudes that fail to meet current standards or needs. Some agencies may do supplements or addenda to their existing FMPs, while others may be revising and updating, and yet others may be completely redoing their FMP. Given this diversity of approaches, the development of a CRE may occur at any stage, although ideally, it should be hand in glove with development of the FMP in a multidisciplinary setting.

3.3 COMPONENT OBJECTIVES

The CRE should describe how the agency will approach the management of cultural resources under the three fire program areas; fuels management, suppression, and emergency stabilization and rehabilitation. As previously noted, the CRE can be specific and detailed, or it

can describe a process of management. The CRE is subject to review by the SHPO, Native Americans, and the interested public, providing the primary vehicle for consultation. Disclosing specific activities, their effects on cultural resources, and agency treatment of effects in the CRE allows consultation to be “front-loaded” at the FMP level, substantially reducing, if not eliminating the need for project-specific consultation. The ideal level of information for consultation and disclosure will identify effects and treatments to specific cultural resources. However, property-specific planning requires detailed inventory information, and comprehensive inventory information is usually available only for agency units that administer small land areas. Most agencies have inventoried only a small percentage of their lands. The lack of comprehensive inventory should not prevent the development of an effective CRE. Federal Fire Policy does not mandate or require complete inventory.

A robust CRE that effectively meets the agency’s planning needs should be able to predict with reasonable accuracy: (1) the types of resources that are likely to occur within a given area; (2) the likely significance of those resources; (3) the likely effects of the fire management on significant resources; and (4) the measures the agency will use to avoid or minimize harm to those important resources.

Regardless of the timing of development, location of the document, or specificity of the CRE, an effective CRE will allow the SHPO, Native Americans, and the interested public to understand the steps that the agency has taken or will take to identify cultural resources that might be subject to effects from fire activities, and how the agency will consider those properties.

When specific resources cannot be described due to lack of inventory, CREs should provide a range of management alternatives from that will be used to minimize damage to cultural resources. Ideally, a CRE would identify the potential effects and treatments to specific cultural resources but seldom can an advanced planning document accomplish this, particularly for large land units. Alternatively, a NEPA-sufficient document must identify various management trajectories and the decision-making process that the agency will follow. The CRE must identify when and how, in the planning process, the concerns of the public may be voiced and considered.

3.4 TYPES OF CREs

As a general rule, the more specific the CRE is regarding the cultural resource management process and the greater the assurance of cultural resource protection, the less concern and request for review of specific fire management projects there is likely to be from the SHPO, Native Americans, and the interested public.

3.4.1 Specific CREs

An agency unit with lands ranging in size from a few to several thousand acres may find that it can identify all of the cultural resources within its jurisdiction. There may be no need for inventory procedures, and the nature and importance of known resources may be reasonably well understood. Under such circumstances, the CRE could describe specific management prescriptions for each cultural resource. This specific management information might be located in a separate CRE as a supplement or addendum to the FMP. A small agency unit with modest

numbers of cultural resources might be able to incorporate specific cultural resource information directly into the FMP, without having to prepare a separate, supporting CRE document. Circumstances in which cultural resource management information might be included in a FMP in its entirety:

- (1) Agency units that manage small areas may find that they either have, or could obtain, a complete inventory of cultural resources within their administrative boundaries;
- (2) an inventory (complete or not), where the number of resources can be reasonably predicted and their numbers are small;
- (3) cultural resources stewardship and management is the primary mission of agency.

3.4.2 Process-Oriented Elements CREs

Many agency units manage relatively large land areas that have not been inventoried or those lands contain so many cultural resources that developing individual management prescriptions for each and every cultural resource is impractical. In such circumstances, the CRE must describe the process by which cultural resources will be identified and considered in the context of fire management.

FMPs are envisioned as the primary documents by which to meet NEPA requirements, as indicated by the following excerpt from National Park Services Reference Manual 18 (Chapter 4, page 1):

The FMP will incorporate a programmatic approach to the National Environmental Policy Act of 1969 (NEPA) that covers all activities described in the fire management plan. This will eliminate the need to write NEPA documents for all projects addressed in the FMP. Additional NEPA (Environmental Assessments (EAs) or Categorical Exclusions (CEs) for specific burns) would need to be done only if external controversial issues arise.

In order to meet the disclosure requirements of NEPA and be able to move from FMPs to Burn Plans or other specific fire management activities without further NEPA documentation, FMPs must either: (1) identify specific proposed activities, their locations, their likely effects on the human environment, and how the agency will avoid or minimize adverse impacts; or (2) provide a detailed picture of the process under which the agency will identify, evaluate, and manage cultural resources. This description should be sufficiently detailed that the public can determine how the agency is likely to act under a narrow range of alternatives.

4.0 PLANNING TO PLAN

4.1 DETERMINE THE TYPE OF PLAN

Two types of CREs, specific and process-oriented, were described in Section 2.3. The cultural resource specialist should, prior to conducting extensive background research, determine the type of plan that is most practical and effective for the agency unit. Unless the unit lands are small and considerable inventory has been performed, it is likely that a more process-oriented CRE will be practical.

However, it may be desirable to develop a CRE that combines specific and processual management approaches. For example, an agency unit such as Yosemite National Park manages over 760,000 acres of land in the Sierra Nevada, yet the vast majority of park use occurs on less than about one half of one percent of that area – in Yosemite Valley (about 4500 acres). The bulk of park development occurs in this area, past, present, and future. Cultural resources inventory information is also most extensive for the valley and travel corridors through the park. Many public lands have such focal areas of intensive use and development. This pattern of land use and existing inventory may warrant plans that are resource-specific in focal areas, and process-oriented in less used and less inventoried areas.

4.2 WHAT LEVEL OF INFORMATION IS NEEDED?

The level of detailed information regarding cultural resources that is needed for an effective CRE will depend entirely on the type of management that is intended. If an agency intends to protect and avoid fire and fire-related activities on all cultural resources, regardless of type and sensitivity, then inventory information may be all that is required. If cultural resource locations and boundaries are identified, then any of a number of protection and avoidance measures can be taken to prevent fire on those resources. There is little need to know the depth or content of archaeological sites, or the function of historic sites to physically protect them. However, total avoidance may protect cultural resources from damage in the short run but it may result in increased fuels loads that ultimately do greater damage when wildfires burn. In addition, protection and avoidance can be costly. Some cultural resources are unimportant and do not merit the cost of protection.

4.2.1 Understand Resource or Land Management Plan Goals and Objectives

A necessary first step in understanding the approach to planning that will be emphasized on agency unit lands is to identify the land management direction and goals, which will vary greatly between agencies and units. Thus, one national park may exist to interpret cultural resources, while another may emphasize biological resources or natural scenery. Other agencies, such as the USDA Forest Service or BLM, have multiple use mandates, and their goals may be stated rather generally, such as, "...maintain or restore ecological sustainability to provide a sustainable flow of uses, values, products, and services from these lands" (Eldorado National Forest Fire Management Plan (2001:3)). Such broad statements are hardly helpful in determining the emphasis of land management. For that type of information, one must dig deeper into land management plans to determine how various areas are valued, and identify the

emphasis of land management in those areas. Many agency unit land management plans allocate or ascribe primary land uses emphases for various geographic areas within their jurisdiction. These may be variously referred to as “emphasis zones”, “management areas”, “management units”, “special interest areas”, etc. Such designations indicate the focus of land use that, presumably, recognizes the highest value and best use of the land for public benefit.

Figure 1 depicts an example of land use allocations from the Eldorado National Forest (ENF) Land and Resource Management Plan (LRMP) (1988).¹ The ENF LRMP organizes the Forest into six types of “emphasis zones”, each of which stress distinctly different, predominant management theme. Figure 2 lists the color-coded legend associated with each Emphasis Zone depicted in Figure 1. Land use prescriptions and treatments are oriented to the theme.

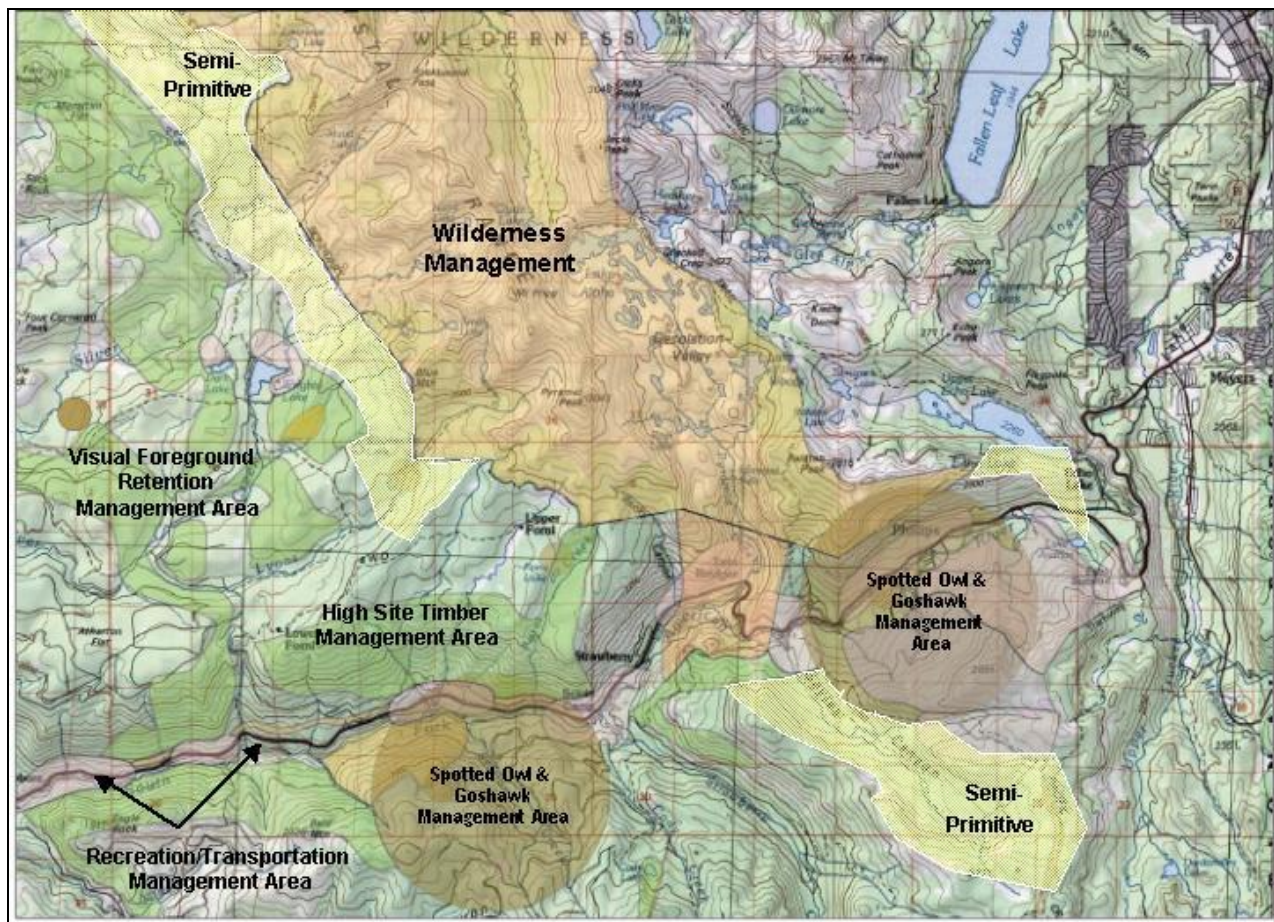


Figure 1. Management Areas on a Portion of the Eldorado National Forest, California.

Emphasis Zones are further subdivided into Management Areas, which define land units to which compatible land use practices and management prescriptions apply, as evident from the

¹ The Eldorado National Forest Land and Resource Management Plan (1988) was amended where inconsistent with the Sierra Nevada Forest Plan Amendment (2001). Management direction and land allocations in the existing (1988) plan remain in effect unless superseded by or in conflict with decisions made from the Sierra Nevada Forest Plan Amendment.

Alternative A - PRF		
Land and Resource Management Plan		
November, 1988		
Management Area	Emphasis Zone	NF Acres
Designated		
1. Wilderness		115,753
2. Wild and Scenic River		14,361
3. Research Natural Area		2,562
4. Special Area		20,623
High Country		
5. Primitive		281
6. Semiprimitive Nonmotorized		16,833
7. Semiprimitive Motorized		27,569
8. Roaded Natural		13,855
Developed		
9. Existing Recreation		884
10. Potential Recreation		2,535
11. Existing Winter Sports		5,255
12. Potential Winter Sports		4,017
13. Private Sector Recreation		2,279
14. Administrative Sites		250
15. Placerville Nursery		218
16. Institute of Forest Genetics		234
17. Transportation Utility Corridor		0
Wildlife		
18. Spotted Owl		60,800
19. Goshawk		4,473
General Forest		
20. Visual Foreground Retention		19,306
21. Visual Foreground Partial Retention		14,885
22. Visual Middleground Retention		22,315
23. Visual Middleground Partial Retention		29,967
24. High Site Timber		131,795
25. Uneven Aged Timber		25,401
26. Low Site Timber		23,844
27. Type Conversion	These areas are made up of small dispersed units which can not be mapped at this scale.	0
28. Meadow Management		2,937
29. Maintenance		27,817
Streamside		
30. Streamside Management Zone		27,200

1/ 2,880 acres overlap wilderness
2/ 300 acres overlap wilderness
3/ 5,476 acres overlap wilderness
4/ 21,200 acres included in suitable land base
5/ 755 acres overlap other management areas

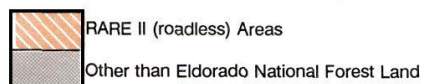


Figure 2. Legend for Eldorado National Forest Land and Resource Management Plan Map, Alternative A - Preferred. 1988.

descriptions in Figure 2. Each of these areas is keyed to text that describes the management emphasis as well as the management practices that must be followed for resources and activities within the Management Areas. Resources and land use activities that are not the emphasis of land use are considered within the context of the plan, but are often considered as constraints, limitations, or planning considerations in using the land in the desired manner.

The land use foci and prescriptions described in agency land management plans will direct the manner in which fire will be used and managed. For example, roads and vehicles may be excluded from wilderness areas, limiting access by fire suppression equipment. Furthermore, the management goals and objectives for a wilderness area may be to allow natural wildland fires to run their course or otherwise use wildland fires for resource benefits. This land management policy has direct implications for the protection of cultural resources that may be quite different than the policy and practices designated for wildland/urban interface areas. Protection of cultural resources during wildland fires may be more difficult or impossible, not only because transportation and fire suppression capabilities are hindered, but suppression efforts themselves are limited. Therefore, strategies for cultural resource management should be different in order to meet these very different fire management approaches.

Identify Fire Management Units and Associated Prescriptions

Fire Management Units (FMUs) are land management areas definable by objectives, topographic features, access, values-to-be-protected, political boundaries, fuel types, or major fire regimes, etc., that sets it apart from management characteristics of an adjacent unit. The FMP is supplemented by operational procedures such as preparedness plans, preplanned dispatch plans, prescribed fire plans and prevention plans. Fire management practices within an FMU are consistent. FMUs are not necessarily contiguous with other land management designations, although there is a direct relationship between the two, since the use and management of fire is predicated by the land management emphasis. However, an FMU can encompass or cross-cut such land management designations if the fire management practices are similar. In short, FMUs circumscribe lands that share similar fire management concerns.

Returning to the ENF example, Figure 3a depicts the land use allocations extracted from the LRMP and Figure 3b depicts the Fire Management Units. Semi-Primitive and Wilderness Management Areas (Figure 3a) are combined into a Fire Use FMU (Figure 3b). Strategic management objectives derive from the LRMP.

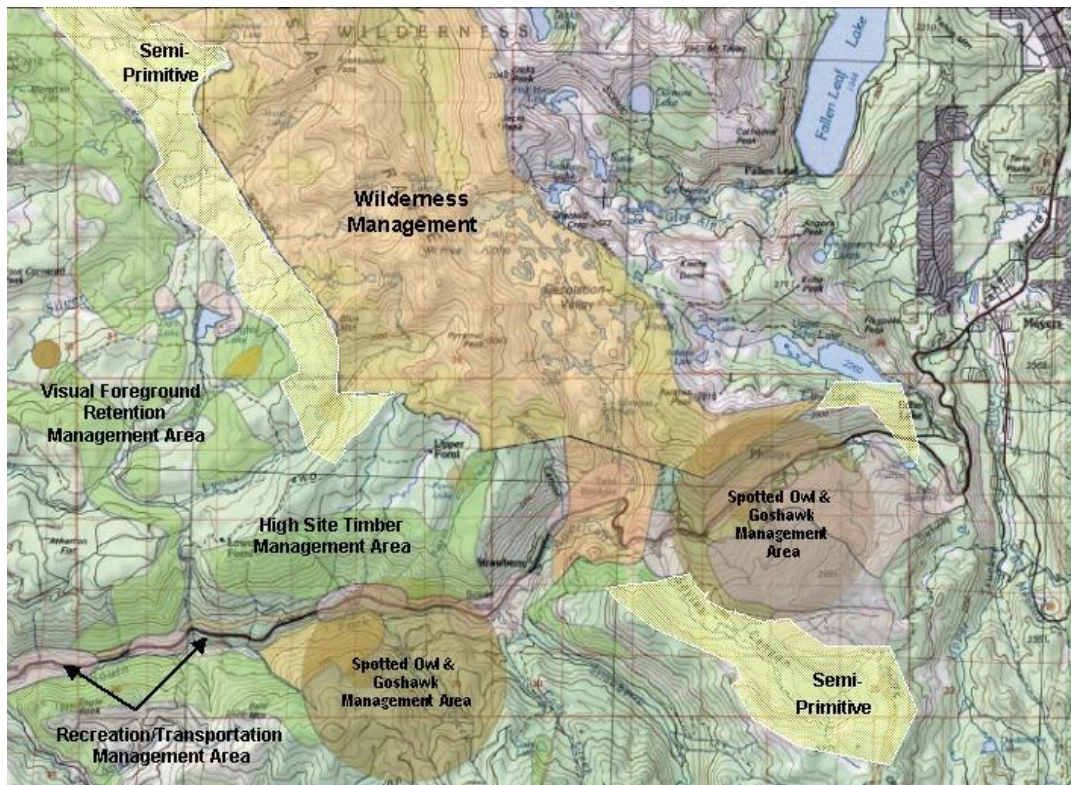
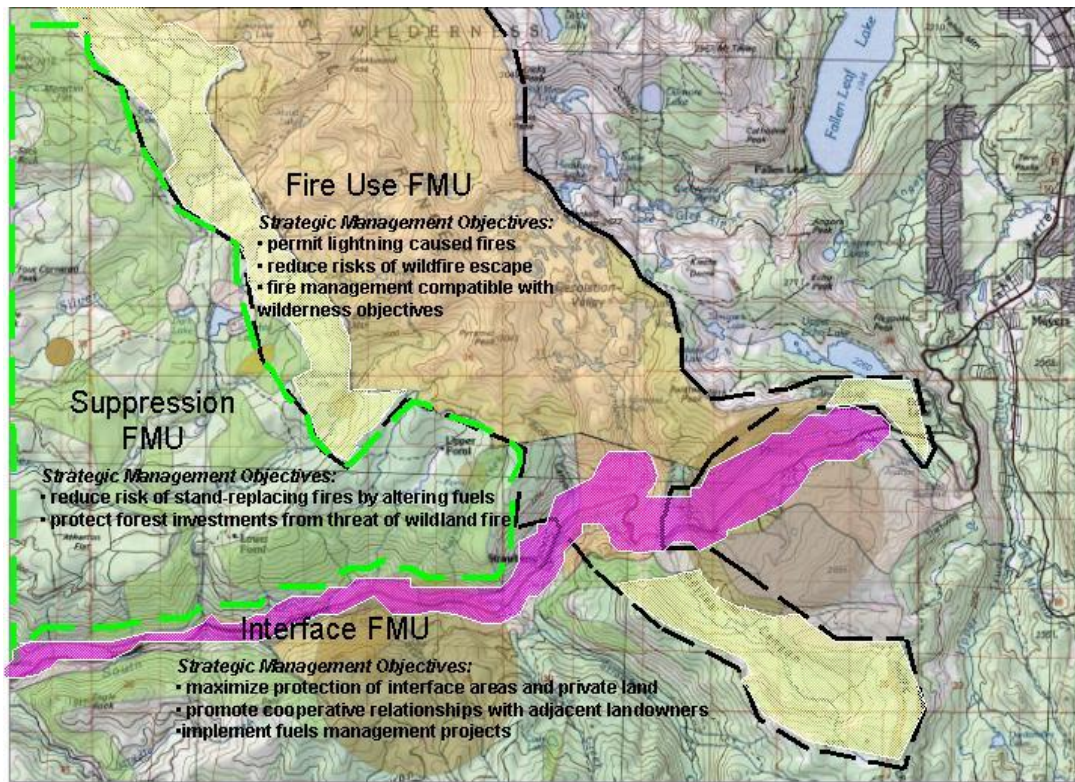


Figure 3b. Management Areas on a Portion of the Eldorado National Forest, California.

F Figure 3a. Management Areas on a Portion of the Eldorado National Forest.



In the following example, the ENF Fire Management Plan summarizes LMP directions for three FMUs in a portion of the forest as follows:

Desired Future Conditions - Opportunity Classes

Opportunity Classes describe the range of desired conditions to be maintained or restored in the wilderness area. Opportunity Class designations are similar to the Recreational Opportunity Spectrum (ROS) used in the National Forest System. Within the ROS system, only two classes, Primitive and Semi-primitive Non-motorized, apply to wilderness areas. Opportunity Classes allow managers to develop a range of desired conditions that are specific and acceptable within wilderness. Appropriate management activities can then be determined (ENF FMP 2001:19).

Fire Use FMU

This FMU contains the two wilderness areas on Eldorado NF...This FMU also includes areas outside the wilderness of similar ecotype and elevation, and fire regime.

Fire management options in wilderness and non-wilderness land may include fire use for resource benefit, and management ignited prescribed fire. These may be used only after a wilderness fire use guide is completed for any individual wilderness, which includes detailed and specific guidance for the management of wildland and prescribed fire. Until a wilderness fire use guide is completed, all wildland fires will receive an appropriate suppression response, to be determined

during the initial fire assessment (stage I) and during any subsequent WFS development.

Strategic Management Objectives:

- Permit lightning caused fires to play, as nearly as possible, their natural ecological role within wilderness (FSM 2324.2).
- Reduce, to an acceptable level, the risks and consequences of wildfire within wilderness or escaping from wilderness (FSM 2324.2).
- Maintaining air quality standards is a consideration during all fire management activities in wilderness.
- Fire management activities will be done in a manner that is compatible with wilderness management objectives.
- Firefighter and public safety are the highest priority for all fire management activities.

Suppression FMU

This FMU is referred to as the suppression FMU. This FMU is situated within various land allocations as described within the Sierra Nevada Forest Plan Amendment. A full range of fire management activities including fire use or an appropriate suppression response may be incorporated as fire use guides are developed, and predetermined areas are identified. A resource advisor should be consulted when developing objectives, strategies, and tactics on wildland fires.

Strategic Management Objectives:

- Reduce the risk of stand-replacing fires by altering fuel profiles with appropriate treatments.
- Protect Forest investments, such as plantations and campgrounds, from the threat of damage from wildland fire.
- Management Constraints Affecting Operational Implementation:
- All fire management activities will consider safety of personnel and the public as the highest priority.
- Treatment of natural fuels or fuels resulting from resource activities will be determined during ecosystem analysis.
- Smoke management and air quality will be a consideration during all project planning.
- Forest investment protection (plantations and campgrounds, etc) will be a consideration during all project planning.
- Design fuel treatment and fire suppression strategies, practices, and activities to meet Aquatic Conservation Strategy objectives in riparian reserves.
- Implement suppression strategies to provide the least possible adverse impact to cultural resources.
- Use MIST tactics in all LMP defined recreation areas and in Research Natural Areas (RNA).
- No natural fuel treatments will be made within RNA's without appropriate planning and approval by the Research Natural Area Committee (RNAC).

General Description:

This FMU is considered general forest within the Sierra Nevada Forest Plan Amendment. The general forest is comprised of national forest lands that lie outside wilderness areas, wild and scenic rivers.

Interface FMU

This fire management unit encompasses urban interface areas within the National Forest Protection Area, all private lands within the National Forest Protection area, and state protection within the National Forest Boundary.

Appropriate suppression response in this FMU is restricted to aggressive control strategies regardless of ignition source. Standards and Workbook from the SNEF will be followed to ensure adequate fuels treatment is implemented on National Forest Land adjacent to the urban interface.

Strategic Management Objectives:

- Maximize protection of interface areas and private lands.
- Promote cooperative relationships with adjacent landowners, and other agencies in order to implement fuels management projects within the Inner Zone of the Urban Intermix.

Management Constraints Affecting Operational Implementation:

- All fire management activities will consider safety of personnel and the public as the highest priority.
- Treatment of natural fuels or fuels resulting from resource activities will be determined during ecosystem analysis.
- Smoke management and air quality will be a consideration during all project planning.
- Forest investment protection (plantations and campgrounds, etc) will be a consideration during all project planning.
- Design fuel treatment and fire suppression strategies, practices, and activities to meet Aquatic Conservation Strategy objectives in riparian reserves (ENF FMP 2001: 20-24).

The ENF FMP includes chapters of the appropriate management responses to meet the management objectives for each FMU. Agency FMPs may be even more specific with regard to fire management directions and activities within FMUs. These management directions provide the basis for understanding the constraints and opportunities for managing cultural resources within each FMU. Cultural Resource Elements should be tiered to the specific fire management directions specified in the FMP.

4.2 COLLECT AND ASSESS EXISTING INFORMATION

Decision making in regional or local plans should be preceded by at least the data compilation phase of an initial or updated Class I Regional Overview. Depending on the adequacy of existing inventory data relative to the issues to be addressed in decision-making, a Class II survey may also be needed in selected portions of the plan area. Some decision making may not require additional cultural resource data, depending of the land use issues to be addressed and the potential effects on, or constraints imposed by, cultural

resources (BLM Manual 8110.46B).

4.3.1 Background Research

The process of CRE development begins with background research to identify what is known about cultural resources and land use within planning units. This background research may be very similar to that conducted for specific undertakings, depending on the size of the agency unit. Very large units (e.g., hundreds of thousands of acres or more) may not be able to conduct detailed records searches for the purposes of the CRE, although background research should be sufficient to identify the historic contexts that are represented within agency lands. The identification of historic context allows the agency to make reasonable predictions about the types of cultural resources that are likely to be present. Historic contexts also provide a backdrop for the evaluation of individual property types. Finally, background research and the identification of historic contexts should provide pathways for the agency to conduct project-specific research at later dates and identify specific properties and their cultural values.

Background information includes existing inventories such as old survey reports, inventory base maps, predictive models developed for the region, ethnographies, and historic records. Background research also involves checking the National Register for listed properties, and the SHPO's files of properties that have been determined both eligible and ineligible for the National Register. Background research is a routine activity for cultural resource specialists, and this workbook will not review the potential myriad sources of information that may be consulted. However, information sources vary by region and agency, and cultural resource specialists should be familiar with the sources relevant to their areas.

Paleoenvironmental data is a potentially important type of information that may affect the need for, and nature of, cultural resource inventories, evaluations, and treatment. Data that are perhaps the most directly relevant to fire management is the past occurrence of fire on the landscape; both natural and cultural. Fire histories may not be available for a specific geographic area, but data are often available for the region or similar vegetation types. Ethnographic information may provide ancillary information regarding the extent and frequency of fire use on the landscape. Such data can provide information on the potential that certain resource types have survived, or the possible effects of past fire on existing cultural resources. An example of a summary of regional fire history is provided below. Note that, while general in nature, the following summary nonetheless conveys the likely frequency of early historic and prehistoric fire within Sierra Nevada ecosystems.

The extensive record of fire and its role in Sierran ecosystems is reflected by the common presence of charcoal in Sierran soil deposits that represent the Holocene. Skinner and Chang (1996:1042) note that large charcoal peaks from the early Holocene were followed by vegetation that was considerably different than the charcoal record predating this early Holocene period of heightened fire activity (Edlund and Byrne 1991). However, that the resolution of temporal data for the Sierra Nevada is insufficient to define the interplay of fire and vegetation.

Sediment cores show an increase in charcoal concentrations in sub alpine forest vegetation at the end of the Pleistocene, coincident with climatic warming beginning about 10,000 years ago. The charcoal record for the Holocene varies in abundance and composition, reflecting shifts in climate and vegetation, but charcoal is routinely

present in sediment core samples (Smith and Anderson 1992).

Tree-ring analysis reveals that thirty years was the longest period without fire in any of five sequoia groves during the last 2,000 years, but fire scar records also show that many of these same groves have not experienced fire for over 100 years under modern management policies (Swetnam 1993).

One of the classes of data revealed by fire history research presented by Skinner and Chang (1996) is fire-return intervals, graphically summarized in Figure 4.

The studies from which Figure 4 was extracted were conducted in a number of different vegetation zones, presented by Skinner and Chang (1996:1045-1046). Fire histories throughout the Sierra indicate that many Sierran fire regimes are presently outside the reference variability (also called the historical range of variability) with regard to frequency, severity, stand structures, and landscape mosaics. While fire histories are not comprehensive throughout the Sierra Nevada, they paint a consistent picture of Sierran fire that was more frequent and far less severe than those experienced under 20th century fire suppression (Jackson 1998:7).

Fire histories may lead cultural resource managers to conclude, for example, that there is a low potential for historic structures within a prescribed fire area because a large 1960s wildfire would have destroyed any structures. Such information may/should influence the nature of a cultural resources inventory. A regional fire history may indicate fire return intervals of ten years, with a very large, hot wildland fires on the average of every 500 years. Such information may indicate that late prehistoric sites may have experienced only low-intensity fires and have suffered few fire-related impacts, whereas old sites almost certainly have experienced repeated, extreme wildland fires. Such information can assist in determining whether there is need for special protective measures for fuels management projects, as well as setting preservation priorities for fire suppression.

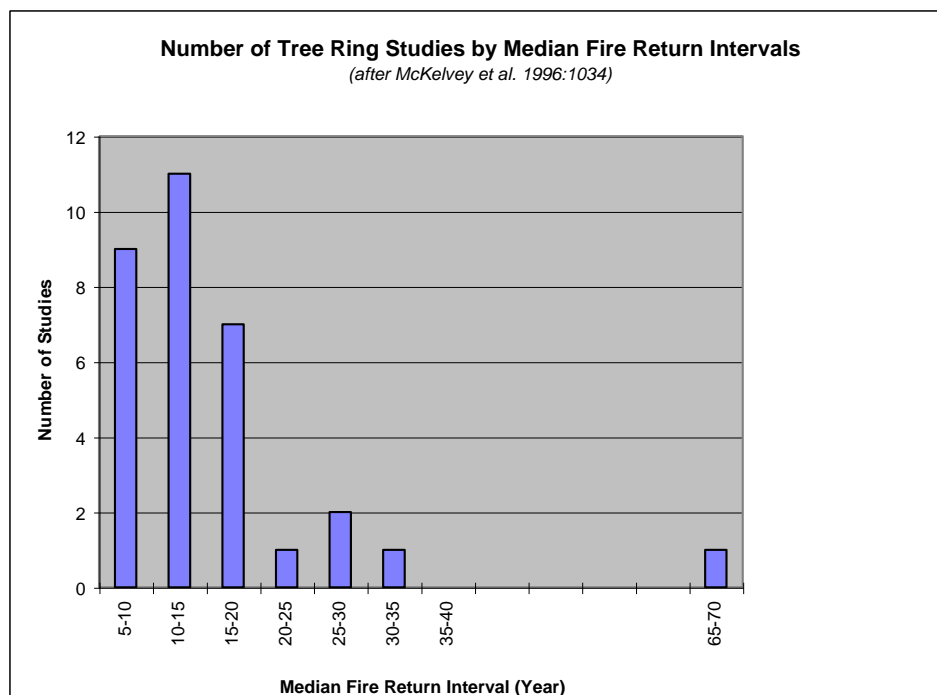


Figure 4. Historic Fire Return Intervals in the Sierra Nevada

4.3.2 Consultation with Indian Tribes

It is important to seek information from Native Americans and other groups that may use or place high cultural value on cultural resources. Agencies should use their existing contacts and avenues of consultation (e.g., NEPA consultation lists and procedures) to solicit information regarding the location of resources and values that may be important to Indian tribes and relevant to fire management. Existing cultural resource reports or ethnographic overviews may be a good primary source of information, but it may not always be an adequate substitute for first-hand consultation. The type of consultation (e.g., letters, telephone calls, email, tribal council meetings, in-person interviews) should be developed according to the circumstances of specific agency unit and the relationships they have with Indian tribes and other groups with interests in the public lands.

Consultation during the development of an FMP and CRE cannot be overemphasized. This consultation may be the first of potentially several, or it may be combined with consultation regarding desired cultural resource treatment approaches. There is no fixed procedure for consultation during this planning process, although consultation should be sufficient for Indian tribes to understand how the agency will inform and involve them in fire management activities, communication protocols, and the management direction that the agency will follow in considering cultural resources during fire management activities. For some agencies, the CRE might describe specific protection or treatment measures for important resources, when information regarding such resources is available. In other instances, the CRE might outline a range of acceptable treatment alternatives for certain resource types, when particular resource locations are unknown or unavailable but concerns over those types is identified. Other CREs may simply describe a consultation protocol.

Early consultation is also important in identifying the potential for fire applications for cultural resource benefits (e.g., rehabilitating natural resource areas, managing native plant areas).

4.3.3 Reconnaissance or Sample Inventory

If there are no previous inventories in certain areas, and existing cultural resource information is all but absent, what then? Apart from Alaska, most federal lands have some level of cultural resources inventory, but there may be “holes” within that inventory for which no information is available. Extensive background research may prove unproductive in such areas.

If background research reveals that existing information does not provide a reasonable basis for determining the types of cultural resources that are present or are likely to be present, then sample or reconnaissance survey might be appropriate for development of an adequate CRE. Requests for funding of planning-related inventory are likely to be critically received, but the payoff for a little sample survey may be great, if future survey needs can be reduced or focused.

Agencies that are developing Section 110 inventory programs might consider fire management planning needs when selecting survey areas.

While he does not specifically identify reconnaissance or sample inventory, Stanfill (2002) discusses the possibility that additional information gathering may be necessary prior to completing a FMP.

If the available information is inadequate, a strategy designed to correct the specific deficiencies should be developed in a Cultural Resource Project Plan, and implemented either prior to completing the FMP or as a procedural element to project decision making. For example, a data gathering strategy may be a condition to the FMP, and the actions called for under the strategy’s terms may be coordinated with and integrated in fire project planning to ensure that project plans are carried out consistent with the strategy. If a data gathering strategy is necessary, it is important to include a commitment in the FMP to follow through with the strategy as part of the project approval process.

5.0 ORGANIZING DATA

This section discusses the organization of cultural resource information within Cultural Resource Elements of FMPs. As used in this workbook, “organization” means more than methods of accessing information; it means limited interpretation and classification of cultural resource information for useful management purposes.

Complete cultural resource information is seldom available for large geographic areas administered by federal agencies. Therefore, limited available information must be organized in ways that allow the agency to understand the relative values associated with cultural resources, establish priorities, and make informed management decisions.

The type of plan that is developed may be based, in part, on the type, amount, and quality of information that is available. Section 1.3 discussed the planning hierarchy that include: (1) land or resource management plans that guide land use directions; (2) fire management plans that describe how fire and fire management will be used to achieve land use objectives; and (3) Cultural Resource Elements, which describe how cultural resources will be managed in the face of fire management activities and, conversely, how fire can be used to achieve cultural resource management goals, consistent with the overall land management plans. In order for this hierarchy to work effectively, all three elements must meet certain criteria of adequacy. Stanfill (2001) has proposed three steps in assessing the adequacy of existing information for BLM fire planning as follows:

- A. Assess the adequacy of the existing Resource Management Plans for fire planning needs.
- B. Develop creative ways to organize the existing data into useful format, and in a manner that accommodates planning needs, schedules, and budget.
- C. Determine whether additional information is needed for fire planning purposes and develop a strategy for acquiring additional information on the scale of the Fire Management Plan.

Data adequacy should be assessed against the type of planning document that is anticipated. Information adequate for a process-oriented plan that calls for follow-up inventory on a project-specific basis may not be adequate if the CRE intends to be the definitive document for treating individual properties. The method of data organization presented here is not the only way to establish a basis for resource evaluation and management, although it is based on federal standards practiced for at least two decades.

5.1 SUMMARY OF STEPS IN DATA ORGANIZATION AND MANAGEMENT

One method of organizing data is based on the identification of historic contexts, which provides the “setting” in which historic activities occurred. These historic contexts are represented by resource types that serve as the icons and material reminders of those activities. Resource types are further considered in terms of their elements, which are the physical traits

that make up cultural resources. Certain of these traits convey the essence of the cultural resource and its value. The nature of these physical traits also determines the effects of fire and fire management activities. Management involves: (1) identifying the value-bearing cultural resource elements of resources; (2) determining if and how those elements will be affected by fire and fire management; and, (3) selecting management actions that consider those values. Note that preservation may not always be the selected management option. Agency units must balance the public benefit of fire management against cultural resource values, when the two conflict. Advance planning in FMPs should strive to minimize those conflicts by providing a wide range of alternatives in the areas of both fire management and cultural resource treatment.

5.2 IDENTIFY HISTORIC CONTEXTS AND RESOURCE TYPES

The purpose of background research is to identify known and expected cultural resources for planning and management purposes. As emphasized by Stanfill (2001:2), agencies should organize the existing data into useful format, in a manner that accommodates planning needs, schedules, and budget.

Management priorities must be established for each of the three fire management program areas. Full protection or avoidance of all cultural resources is neither possible nor desirable, and the highest priorities for protection and management should be afforded to important cultural resources. For example, existing cultural resource information may be used during fire suppression to afford some level of protection to sites that are important and amenable to protection without endangering life or property. Post-fire visits to cultural resources are limited during Emergency Stabilization and Recovery activities to known cultural resources. Therefore, the more comprehensive and more organized the inventory of known resources, the more effective the stabilization effort is likely to be.

The use of electronic data amenable for spatial analysis, such as geographic information systems, is particularly valuable in providing management links and prescriptions for specific land use activities. Although technology can assist in the organization and rapid recovery of information (e.g., databases and GIS), preservation priorities must still be established by human assessments of cultural values. Organizing cultural resources into historic contexts remains the most viable means of understanding the role of cultural resources in past human activities and the potential importance of those resources to contemporary society.

The objectives of identifying historic contexts and associated property types are twofold: (1) provide a framework for understanding the role and importance of cultural resources; and (2) establish a classification of property types that allows the assessment of risk from fire management activities. This assessment of risk is discussed second effects

The National Park Service provides excellent guidance regarding the development and definition of [historic contexts](#).

The significance of a historic property can be judged and explained only when it is evaluated within its historic context. Historic contexts are those patterns or trends in history by which a specific occurrence,

property, or site is understood and its meaning (and ultimately its significance) within history or prehistory is made clear. Historians, architectural historians, folklorists, archeologists, and anthropologists use different words to describe this phenomena such as trend, pattern, theme, or cultural affiliation, but ultimately the concept is the same.

The concept of historic context is not a new one; it has been fundamental to the study of history since the 18th century and, arguably, earlier than that. Its core premise is that resources, properties, or happenings in history do not occur in a vacuum but rather are part of larger trends or patterns.

In order to decide whether a property is significant within its historic context, the following five things must be determined:

- The facet of prehistory or history of the local area, State, or the nation that the property represents;
- Whether that facet of prehistory or history is significant;
- Whether it is a type of property that has relevance and importance in illustrating the historic context;
- How the property illustrates that history; and finally
- Whether the property possesses the physical features necessary to convey the aspect of prehistory or history with which it is associated.

Further specific guidance is offered by NPS in [National Register Bulletin 15: How To Apply the National Register Criteria For Evaluation](#) and [Bulletin 16: How To Complete the National Register Registration Form](#).

Background research should, in most cases, allow the agency to define the historic contexts that characterize the different areas of their unit. The historic context may be very specific or quite general, depending on the nature of the background information. For example, historical overviews and past research may identify the operation of a specific historic railroad logging company within a certain area. Alternatively, there may be only inventory information that indicates the presence of historic railroad logging, although the identity of the company and specific details of the operation are not currently researched. It is impractical to expect that extensive, detailed historical research will be conducted for a CRE, so the specificity of historical information is likely to be based on existing and easily accessible sources of information (e.g., agency inventory files and overviews). Whether historical information is specific or general, historic contexts can be identified and either the known or the suspected cultural resource types associated with those historic contexts can be identified. Historic contexts should be briefly identified by stating the theme, the time period during which the events or historic/prehistoric activities took place, and the geographic limits of historic context. These parameters can be narrow or broad, depending on the nature of the theme. For example, the historic context for historic period can often be more specifically identified in terms of a few years. Prehistoric

contexts, on the other hand, may span millennia. What is most important is identifying historic contexts that provide a framework to understand the role and importance of specific resources and resource types.

Once historic contexts are identified, it is possible to list the property types that represent those contexts, as described in [NPS National Register Bulletin 15](#):

A context may be represented by a variety of important property types. For example, the context of "Civil War Military Activity in Northern Virginia" might be represented by such properties as: a group of mid-19th century fortification structures; an open field where a battle occurred; a knoll from which a general directed troop movements; a sunken transport ship; the residences or public buildings that served as company headquarters; a railroad bridge that served as a focal point for a battle; and earthworks exhibiting particular construction techniques.

Because a historic context for a community can be based on a distinct period of development, it might include numerous property types. For example, the context "Era of Industrialization in Grand Bay, Michigan, 1875 - 1900" could be represented by important property types as diverse as sawmills, paper mill sites, salt refining plants, flour mills, grain elevators, furniture factories, workers housing, commercial buildings, social halls, schools, churches, and transportation facilities.

A historic context can also be based on a single important type of property. The context "Development of County Government in Georgia, 1777-1861" might be represented solely by courthouses. Similarly, "Bridge Construction in Pittsburgh, 1870-1920" would probably only have one property type.

Historic contexts are heuristic classifications that define topics of interest, and as such those interests may be oriented to management concerns. For example, "western capitalist expansion in the 19th century" may be a perfectly acceptable academic topic for which a wide range of property types could be identified. However, such a historic context may not be particularly useful in identifying and evaluating properties in need of management on a National Forest. Railroad logging during the 19th century may be a more practical historic context for defining property types for management purposes.

Alternative contexts may be defined for the same geographic area and even some of the same resources. Also, certain property types may be associated with more than one context. Figure 5 depicts an example of several property types and their potential association with various historic contexts. Despite their potential multiple associations, the same resource type may carry different cultural value with different associated historic contexts, depending on its role within those contexts. Therefore, a cultural resource may be a critical representative for one context and relatively inconsequential to another. This makes it difficult to make sweeping statements of significance regarding some types of cultural resources, because their importance depends on their context.

Figure 5. Example of Property Types and Potential Associated Historic Contexts

Historic Contexts	Resource Types						
	Railroad Grades	Mills	Cabins	Landings/Skids	Ditches	Roads	Rock Walls
19 th Century Railroad Logging	X	X	X	X	X	X	X
Gold Rush Era Mining	X	X	X			X	X
Transportation	X		X			X	X
19 th Century Chinese Labor			X		X	X	X
Water Development					X	X	X
Homesteading/Ranching			X		X	X	X

5.3 DEVELOPING MODELS

Another way of organizing and using data is to develop models of cultural resource distribution. Models are based on the synthesis of data and recognition of patterns. A model formally describes proposed patterning and sets the stage for prediction of patterning for as yet unknown resources. The utility of models for fire management is in their potential power to predict cultural resource types and their locations in previously unexamined areas. Models are theoretical constructs that should be tested and refined, as new information is gathered. Models may serve as a systematic tools for establishing inventory or treatment priorities.

5.4 RESOURCE EVALUATION

There are a variety of approaches that agencies may choose to adopt or develop with regard to resource evaluation. The Fire PA places no limitations regarding evaluation, leaving the matter to negotiation between the agency and SHPO/THPO in the context of the CRE. However, individual SHPOs/THPOs may have definite preferences or biases that agencies may be advised to follow if they are to gain agreement from the SHPO/THPO.

The National Register of Historic Places (NRHP) is the traditional tool for evaluation, but the NRHP evaluation process described at [36 CFR 800.4\(c\)](#) is relatively time consuming. The Fire PA provides a mechanism to expedite the review process if agencies and SHPOs/THPOs cooperate to develop expedited review procedures. Such procedures may include:

- standard, project-by-project review of agency NRHP determinations pursuant to

36 CFR 800.4(c); or

- full unilateral agency determinations of NRHP eligibility; or
- partial unilateral agency determinations (e.g., the SHPO/THPO need not review if the agency finds and treats resources as NRHP eligible); or
- agreements with the SHPO/THPO on the NRHP eligibility of certain resource types; or
- programmatic approaches to NRHP evaluation (e.g., identifying standard methods and qualifying threshold criteria); or
- deferred NRHP evaluation if certain conditions pertain (e.g., protection, avoidance); or
- alternative evaluation criteria (e.g., identifying cultural values without restriction to the NRHP criteria); and
- some combination of the above.

SHPOs/THPOs are likely to have preferences, if not strong opinions, regarding the range of evaluation alternatives that they find acceptable. Agency cultural resources staffs are likely to have experience with the SHPOs/THPOs and be able to identify those preferences.

Agencies should work with their SHPOs/THPOs to negotiate a streamlined process of cultural resource evaluation that shortens the standard review process described in 36 CFR 800.4(c), if at all possible. The evaluation process should have at least two components; (1) evaluation of resources at the FMP level; and (2) evaluation of resources on a project-specific basis. FMP-level evaluations are more likely to include listings of properties already determined eligible, as well as categorical or property-type NRHP evaluations. FMPs may also identify programmatic approaches to evaluation that will be carried out on a project-specific basis. The FMP should identify the party(s) that are responsible and qualified to evaluate cultural resources, the review process (e.g., SHPO/THPO review, if any), and procedures to inform the public, Indian tribes, and mechanisms for objecting to agency determinations and resolving those objections. Models for review are available in numerous existing programmatic agreements. Your SHPO/THPO may be able to provide examples, as well as indicate their preferences.

Regardless of the approach developed to formally identify important cultural resources, evaluation efforts must accomplish the same fundamental tasks; they must identify the cultural values associated with cultural resources, and they should describe the specific elements that convey or represent those values. Translated to more traditional language, this last requirement involves identifying of the contributing characteristics of the cultural resource, which may or may not include its environment.

The following discussion of resource elements, risk assessment, and treatment does not rely on any specific approach to evaluation.

5.5 RESOURCE ELEMENTS AND RISK ASSESSMENT

5.5.1 Fire Effects

The term “effect” holds different meanings, depending on the context of its use. Within a regulatory framework such as Section 106, effects are defined as changes in characteristics that render a property eligible for the National Register. In that venue, the determination that a federal action (undertaking) has an effect on a National Register eligible property mandates further regulatory consideration of the property by the agency. Within the context of the Fire PA, the regulatory meaning and consequences of an “effect” will be defined within the context of the CRE, as negotiated between the agency and SHPO/THPO. Since the meaning of “effect” may vary by agency and agency, it is important to define its use in this workbook to denote a change in physical state resulting from fire or fire management activities. Such change may or may not diminish the cultural value of the property.

Seifken (2001:1) classifies various effects to cultural resources in three categories; direct, operational, and indirect. Direct effects are caused by the fire itself and result from heat, combustion, and smoke damage. As noted by Seifkin (2001:1) direct effects are the most troublesome of the fire impacts to the cultural resources because our understanding of the effects of fire on stone, metal, bone, wood and other common materials is not yet satisfactory. A classification of fire severity and corresponding effects to vegetation is offered in Table 1. Increasing fire severity is generally correlated with increasing temperature; hence the greater the fire severity, the greater the risk of damage to cultural resources.

Table 1. Fire Severity Classes

<u>Severity</u>	<u>Characteristics</u>
Low	Light surface fire; some small trees may be killed. In woodlands, fire does not substantially change the structure of the dominant vegetation. Fire can be stand-replacing in shrub and grasslands.
Moderate	Most small trees killed; some sub canopy trees killed or heavily damaged. Charring occurs on the bark of live trees, and overstory trees may occasionally be killed. Larger and fire-resistant trees most often survive. Can be considered a “mixed” severity fire regime.
High	Small and sub canopy trees killed, many to most overstory trees killed. The aboveground parts of dominant vegetation are killed, drastically changing the aboveground structure.
Non-Fire	Little or no occurrence of natural fire.

NOTE: Skinner and Chang (1996:1044); Brown (2000), as Adapted by Siefkin (2001:36).

Operational effects occur from associated operations, for instance line construction or staging. Such effects are primarily mechanical and tend to displace, disarticulate, crush, pulverize, or erode cultural resources.

Indirect effects are changes to local contexts resulting from fire and/or associated operations. Examples of these three types of effects are listed in Table 2.

Table 2 . Types of Fire and Fire Management Effects on Cultural Resources.

Direct Effects	Operational Effects	Indirect Effects
<ul style="list-style-type: none"> •Fire ground surface aerial 	<ul style="list-style-type: none"> •Fire Lines natural, hand, wet, and dozer lines •Staging roads, parking, pullouts base camps, spike camps helispots, drop spots safety zones looting •Retardant chemical, water, dirt •Mop up/Rehab excavation tree felling introduce stabilizing vegetation 	<ul style="list-style-type: none"> •Runoff and erosion •Tree mortality (tree fall) •Increased burrowing rodents and insects •Increased microbial population •Carbon contamination •Increased isolation

Physical elements of cultural resources have varying degrees of susceptibility to heat. In general, organic materials are less resistant to heat effects than minerals and other inorganic materials. Figure 6 depicts various heat effect thresholds for a variety of materials. This graphic, developed by Dr. Kevin Ryan of the U.S.D.A. Forest Service, should be considered a “work-in-progress”, and may not account for variables such as the speed of heating and the mass of the heated objects, both of which can affect material reaction to heat. The data in Figure 6 is supplemented with similar information in Table 3 for metals that comprise much of the historic archaeological material record. These data suggests that fire management practices may be able to manipulate or control some of the variables that may affect certain materials in order to protect the material elements that convey cultural value. For example, chert may withstand a 500 degree C fire without damage to morphology (Figure 6), so a chert flake scatter would not be affected by a relatively cool fire. However, add faunal bone to the same prehistoric site and a fire of the same temperature would damage the bone. A moderately severe fire may result in the smudging of a historic brass belt buckle, but the morphology and detail of the buckle will remain intact unless the fire substantially exceeds 900 °C. Additional research is needed to refine the heat thresholds and affective variables for many specific materials, but the need for immediate, practical management (beyond total avoidance) mandates that agencies allow the reduction of fuels and achievement of other fire management by applying prescriptions that by attempt to afford some protection, even if the success of those prescriptions is not always ensured. Continued experimentation and adaptive management will result in the refinement of our understanding of heat effects and improved methods of protection.

Figure 6. Temperature Thresholds For Effects to Various Materials

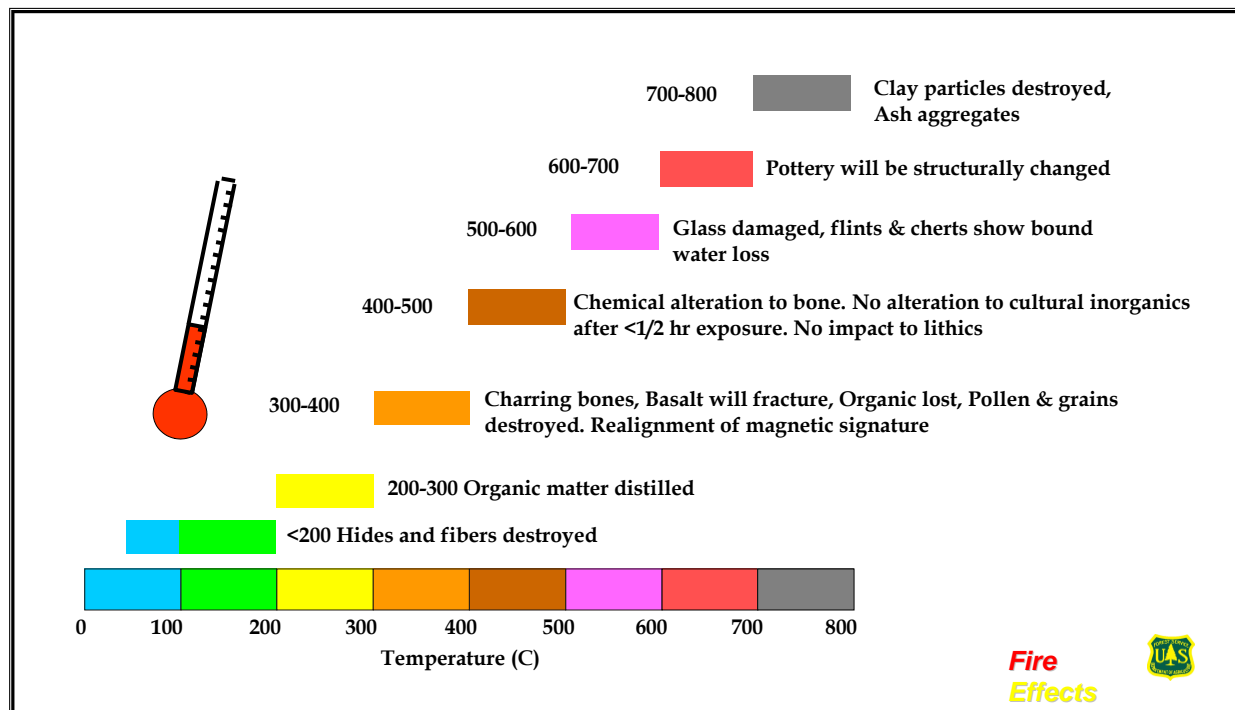


Table 3. Melting Points of Metal Materials Commonly Found on Historical Archeological Sites

Type of Material	Temperature (°C)	Artifact Types
Aluminum	660	Kitchenwares
Brass (yellow)	932	Cartridge cases, military buttons and insignia
Cast iron	1,350 to 1,400	Kettles, Dutch ovens, wood stoves
Copper	1,082	Kitchenwares, building materials, coins
Gold	1,063	Coins, jewelry
Iron	1,540	Tools, nails, horseshoes, cans, corrugated roofing
Lead	327	Bullets
Nickel	1,455	Plating
Pot metal	300 to 400	Flatware, pots, faucets
Silver	960	Coins, jewelry
Solder (tin)	135 to 177	Patch repair on brass and iron objects
Steel (stainless)	1,427	Eating utensils, kitchenwares
Steel (carbon)	1,516	Heavy machinery parts
Tin	232	Kitchenwares, toys, building materials
White pot metal	300 to 400	Kitchenwares
Zinc	375	Plating for iron objects

NOTE: Haecker (2000:10-11) as adapted by Seifkin (2001:38).

5.5.2 Using Property Types and Elements to Assess Risk

In addition to their use as a framework for resource evaluation, the identification of historic contexts and property types allows us to identify the important property elements that may be subject to fire damage by the following steps: (1) break down property types into their constituent parts or elements; (2) determine which of those elements impart the important

cultural values associated with the property; (3) assess the risk that fire or fire management activities will damage, degrade, or destroy the property elements that convey cultural value; and (4) focus management on the protection of those physical elements.

5.5.3 Models Revisited

As Stanfill (2002) notes, “Modeling can...be used to predict the vulnerability of cultural resource types to specific types of management activities such as fire.” He advocates the development of vulnerability models that combine estimates of the distribution of cultural values (significant properties), with the nature of the effects that may occur.

For fire management purposes, variables important for contributing to informed decisions about the effects of fire on cultural resources should include the following:

1. Cultural Resource Distributions (the spatial arrangement of cultural properties on the landscape);
2. Cultural Resource Values (the significance of known and anticipated properties in the context of the National Register criteria and use allocations);
3. Cultural Resource Sensitivity to Fire (the qualities that contribute to the significance of known and anticipated cultural properties, and their vulnerability to the effects of fire and fire-related activities);
4. Fuel Load (the volume of live and dead vegetation that can contribute to combustion);
5. Fire Regime (the nature of fire that occurs over a long time period and its prominent immediate effects to an ecosystem).

Models may result in management tools such as fire sensitivity maps. The development of Geographic Information System (GIS) compatible sensitivity and/or vulnerability maps provide an excellent tool for integrating cultural resources planning with fire management planning.

5.5.4 Resources At Risk

We would like to introduce a concept termed *resources at risk*, which has applications at various levels in the planning process. The resources at risk concept recognizes that resources have varying susceptibility to damage from fire or fire management activities, depending on the characteristics of the resource and the specific nature of the fire or fire management activity. Cultural resources at risk are classes of resources that: (1) have some potential to be important (e.g., National Register eligible); and (2) the important characteristics of the class of resources have a reasonable potential to be substantially damaged or destroyed by the nature of the fire that is proposed. The term “substantially damaged” is purposely ambiguous, recognizing that total protection may be impractical. It allows some degree of professional judgment regarding the level of risk or amount of resource damage that will be tolerated. Professional judgment can play an important role in identifying heritage resources at risk, particularly when the effects of

fire on certain types of archaeological materials are poorly understood (e.g., the effects of low-intensity fire on surface obsidian).

The resources at risk concept provides a way of prioritizing management according to the greatest potential for harm. As such, management actions are directed most actively at resources that are at risk of damage. Those that are not at risk may receive little or no attention. This concept can be used to structure inventory efforts or limited to the nature of treatment.

Resources at risk within fuel management project areas will often include historic, above-ground wooden features (e.g., cabins, corrals, fences, flumes, trestles, historic power poles, logging chutes, bow stave trees). Some types of wooden cultural resources may not be recognized by CRSs. Culturally modified trees, for example, may fall victim to fire if not recognized. Depending on the intensity of the proposed fire and other variables, some resource types may be considered resources at risk even if such resource types are not susceptible to substantial damage from fire itself. Such considerations include proximity to public roads, existing public knowledge of sites(s), and visibility of archaeological deposits. For example, if a prehistoric site is well-known to local artifact collectors but the site has been protected from vandalism by heavy shrubs or ground cover, then fuel management projects may expose the site to vandalism and that site should be a resource at risk.

Identifying resources at risk can predicate subsequent identification, evaluations, and management efforts. Use of this concept is certainly discretionary, recognizing the wide range of approaches to planning and diversity of opinions regarding resource protection. It is offered here as a potential planning tool, and its specific intended application would have to be defined and negotiated with SHPOs/THPOs. It is important to note that the concept may be used selectively. For example, an agency or SHPO/THPO may not endorse the resource at risk concept to structure the inventory effort, but they may see advantages to its use in setting treatment priorities.

5.5.5 Fire Return Interval Departure

The Draft Yosemite Fire Management Plan/Environmental Impact Statement (FMP/EIS) presents several alternatives to revise Yosemite National Park's fire management program. An analysis of the natural fire regime for each of Yosemite's main vegetation types combined with the known fire history yielded maps showing the number of fires that have not burned in various areas of the park, expressed in fire return intervals, because of fire suppression. This analysis is termed the Fire Return Interval Departure (FRID). FRID analysis was used to identify and estimate acres of land that need the reintroduction of fire for ecosystem restoration, as well as identify areas where high levels of fuels threaten buildings. Median values resulting from Yosemite's FRID analysis were used to assess risk for cultural resources. Areas exceeding a certain quantitative value, based on the FRID analysis, were identified as more likely to burn at an intensity that would impact cultural resources and those fires would also be more difficult to control to the degree needed to protect cultural resources. FRID analysis, or similar means of determining fire risk based on fire histories and fuel loads, may be an effective way of setting historic preservation priorities such as long-term inventory plans, fuel reduction activities for resources at risk, and emergency action plans in the event of wildland fires.

Yosemite National Park's approach to risk assessment uses the FRID analysis, considering lands that have missed more than three fire return intervals as likely to have unnaturally high fuel loads, which support hot fires that can affect many types of cultural resources. The Yosemite FMP organizes its cultural resources into three primary types: archaeological sites, ethnographic sites, and cultural landscapes (including individually significant historic structures) and establishes criteria for risk assessment based on the type, duration, and intensity of impacts to each class. Types of impact are considered either adverse or beneficial under NEPA, or adverse/not adverse under Section 106. The durations of impacts are measured as short term, long term, or permanent. The intensity of impacts ranges from negligible to major, and each category is defined by the degree of loss of significant characteristics of the cultural resource.

Regardless of the method of classification, risk assignments are valuable for establishing treatment priorities.

6.0 TREATMENT MEASURES

6.1 FLEXIBLE APPLICATION

The procedures for cultural resource evaluation will vary by agency unit and region, depending upon their procedural biases and the results of negotiation with the SHPO/THPO in developing the CRE. Some agencies may attempt to evaluate all resources within a proposed prescribe fire area, while other agencies may negotiate a policy of evaluating only those resources that cannot be avoided or protected. Similarly, there may not be a consensus regarding the efficacy of individual treatment measures, or the circumstance under which such measures are applied. For example, one agency may choose to apply treatment measures only to cultural resources that have been determined National Register eligible. Other agencies may negotiate a practice of deferred evaluation if unevaluated cultural resources will be protected. The decision-making process for applying treatment measures will be determined by the agency unit in consultation with the SHPO/THPO when developing the CRE. Consequently, the treatment measures discussed in this workbook are unlikely to be universally adopted or applied by all agency units. Each agency unit must set preservation priorities and make management decisions regarding what and how much can be protected without impairing fire management program goals.

6.2 TYPES OF TREATMENT MEASURES

This section provides a series of treatment measures from which agencies can choose for their CREs as standard measures for cultural resource protection. These treatment measures may also be modified or supplemented in order to meet agency or individual preferences. As such, the following list of treatment measures may be used selectively or in their entirety, as appropriate to agency unit needs and procedures

The following list of treatment measures is by no means exhaustive. Some of these measures (e.g., hand lines surrounding resources) are designed to provide complete, short-term protection of cultural resources (e.g., avoidance). There are many circumstances where total avoidance is necessary and appropriate. However, total avoidance may have consequences such as the creation of “islands” of unburned vegetation that signals unauthorized artifact collecting or vandalism. Additionally, avoidance may do little more than defer a wildland fire that eventually damages or destroys the resource.

Seifkin (2001) classifies protective measures for cultural resources into two categories – exclusionary and non-exclusionary.

Exclusionary tactics involve preventing fire from burning on or in close proximity to a cultural resource through the use of some predetermined fire management action such as a fire line, sprinkler system, or intentionally burning out the perimeter of a resource. Exclusionary tactics are often employed when it is anticipated, given expected fire behavior, that the fire will burn at an intensity that exceeds the threshold above which a particular resource or resource

attribute is impacted (e.g., ~100° C for obsidian hydration rinds). Other examples of exclusionary techniques that have been employed with success include fire shelters, fire retardants, hand and mechanical fuel removal, and fuel burial.

Non-exclusionary tactics make no attempt to exclude fire from a resource of interest, but instead seek to produce fire intensities below that expected to cause resource damage and/or that will not lead to future indirect effects. Common non-exclusionary approaches to resource protection include hand and mechanical fuel load reduction, burning under favorable prescriptions, and removal of vulnerable resources.

Some of the treatment measures in the following pages are designed to minimize the risk of substantial damage to resources while allowing fire or fire management activities at cultural resource locations. Treatment measures that allow some fire management activities to take place at cultural resource locations may pose greater short-term risk than total avoidance. However, facilitating certain fire management objectives such as fuels reduction may facilitate long-term preservation of cultural resources.

The use of treatment measures briefly described below should be accompanied by specific methods or parameter for their application that maximize cultural resource protection. Agencies and SHPOs/THPOs should reach agreement on how each of these treatment measures will be applied.

Flagging. Cultural resources may be flagged under a variety of circumstances. Flagging, in and of itself, is not a protective measure. The actions that are prompted by the flagging constitute the treatment. The most common use of flagging is to identify an area within which ground-disturbing activities and fire should be excluded.

Buffer Zones. Buffer zones surrounding cultural resources may be employed as a means to lessen the likelihood of inadvertent effects from fire management activities. Buffer zones may also ensure that the setting of cultural resources are preserved, although such protection may require a definitive study to determine the contributing elements of landscapes to those resources.

Redesign. Fuel management projects may be redesigned to exclude the area containing and surrounding the cultural resource(s). Redesign is obviously more appropriate to fuel reduction projects than it is for wildland fire suppression.

Fire Lines or Firebreaks. Cultural resources may be protected by creating firebreaks that eliminate and break the chain of fuels to resources. There are several types of fire lines, each with their own advantages and disadvantages. These include: natural fire lines; wet and retardant lines; scratch lines; undercut lines; hand lines; and cat lines. The advantages of one particular method over another will depend upon the type of fire management activity (e.g., fuels reduction versus fire suppression), fire behavior, and cultural resource variables.

Sprinklers. Sprinklers are used as a preventative measure. The sprinkler is attached to the building (or other cultural resource) and water from a nearby source is pumped through the

system until the threat of fire is past, providing a constant shower over the property to be protected. Possible effects of using the sprinkler include water saturation and collapse, and water damage.

Foam wetting agents (suppressants) and fire retardants. Foam wetting agents, such as [Silv-Ex](#) Wildfire Foam Concentrate, and other [Class A foaming agents](#), are considered fire suppressants applied either to fuels or the base of a flame. Foams may be applied to cultural resources and/or areas surrounding cultural resources to protect them from fire damage. Fire retardants are defined by Teie (1994:167) as "...a substance that, by chemical or physical action, reduces or slows combustion, thus slowing or retarding the rate of spread of the flame front. Most retardants are produced by combining water, several chemicals, and a coloring agent. The main chemical ingredient is a fertilizer."

Back Burning and Ring Firing. Back burning (i.e., purposely burning outside a main fire application) may be used to reduce fuels, thereby buffering cultural resources in order to protect them from either prescribed fires or wildland fires. Ring firing is a related method described by Teie (1994:478) as follows:

This type of firing is used when you are trying to save a valuable resource like a structure, or a historic or archeological site. This method of firing isn't anchored by the fireline. It is designed to create an unburned island.

Fire Fabric or Wraps. [Fire resistant fabric](#) may be placed over combustible cultural resources to protect them from burning. Sometimes called "cabin wrap," this metallic material is attached to the structure with staples to create a nonflammable barrier. Potential effects of fire fabric include inadvertent damage to the cultural resource when attaching and/or removing the wrap.

Burial. The heat effects of fire are generally minimal for even the most severe surface fires when objects are buried 10 cm or more. The burial of woody fuels or archaeological materials is best suited to spot locations, such as stumps, or well-defined features, such as outcrops, where soils can be easily and totally removed without damage to underlying deposits.

Thinning and hand removal of fuels. Thinning reduces stand density by removing fuels. Thinning actions may vary between firebreaks and areas surrounding firebreaks. Pre-commercial thinning involves hand thinning of smaller diameter materials. Commercial thinning, accomplished through timber sales, involves larger materials. Small fuels can be removed from a cultural resource, either to lower the intensity of fire as it crosses the resource, or exclude fire from all or parts of a resource. This removal may involve carrying or dragging dead and downed branches away from the site or fire sensitive resources, or using rakes or leaf blowers to remove smaller debris.

Once thinning is accomplished, the slash must be treated or disposed in some way, including piling the material so it can be burned. The actual piling of the material may be accomplished by hand or machine, where equipment such as dozers and small tractors will haul the material to piles. Slash is also pushed or dragged into windrows. Some slash may be "rough-piled" or "jackpot piled" where heavier concentrations of fuel are left where they fall and are burned on site. Disposal activities should ensure that cultural resources are not situated within the

disposal areas. Several additional methods of fuel disposal are listed below.

Lopping And Scattering - Thinned areas may be “lopped” to reduce fuel slash heights and then broadcast burned. Lopping consists of cutting smaller branches off the main stem so the height of the slash layer is reduced, which in turn allows for a less intense fire if the area is broadcast burned.

Crushing - Crushing involves dragging a large drum with protruding spokes or spikes over the vegetation, effectively breaking the fuel into smaller pieces. Another form of crushing uses a “brush crusher” in which a piece of equipment similar to a “weed-whacker” is attached to a tractor. The “brush crusher” is able to reduce the height of vegetation from 4’ to 6’ down to 6” in height. Both of these pieces of equipment are pulled or transported by either rubber tire tractors, or rubber or metal track dozers. The “brush crusher” may operate on up to a 60% slope.

Chipping - In the chipping process, slash is forced through a chipping machine, reducing the larger pieces of slash to small chips that are spread over the site to be burned at a later date, or left on site to naturally decompose.

Hydro-Ax And Agra-Ax - The Hydro-ax and Agra-ax are large cutting tools attached to a “Bobcat” type tractor (see also Low-impact Logging Equipment, below). They are used in the pinyon/juniper type, cutting trees off at the ground level. The trees are usually left to lay where they fall, assisting in soil retention.

Broadcast Burning - Broadcast burning uses fire over a designated area to consume natural or activity slash that has not been piled or windrowed. Broadcast burning may be used separately or in conjunction with mechanical methods such as thinning. Broadcast burns may be ignited by hand, by “terra-torches”, torches mounted on 4-wheelers or on a flatbed truck, or with aerial ignition. Preparation for the burn may include line building, both by hand and machine.

Pile Burning - Pile burning disposes of hand or machine-piled slash. Piling the slash and burning during cooler, wetter, or winter conditions reduces the chance of escape and lessens the potential for damage to the remaining vegetation on site. Piles are normally ignited by hand using fuses or drip torches.

Directional Felling. Large, heavy fuels that create a fire ladder or carry crown fires can be manipulated both within and surrounding cultural resources to reduce the danger of fire damage. Experienced professional loggers can fell large trees with high precision to avoid sensitive cultural resources (e.g., historic structures, prehistoric archaeological surface features).

Helicopter Yarding or Logging. Trees may be lifted from the ground by helicopter with little ground disturbance. This yarding technique is common for roadless areas and areas with sensitive resource concerns where traditional terrestrial yarding cannot be used. Helicopter yarding usually creates a small amount of ground disturbance where the trailing end of the log is dragged vertically before lifted off the ground. This dragging typically disturbs an area no more than one square meter and disturbs the ground to depths less than 20 cm.

Full-suspension yarding. Various full-suspension yarding techniques may be applied to remove trees with little or no damage to archaeological deposits. Logging equipment such as front end loaders and skidders with steel tracks or rubber tires may be used to carefully and fully lift logs and remove them from the site. Special care and monitoring is necessary to ensure that track or tires do not disturb surface soils.

Low-impact Logging Equipment. Other types of low-impact logging equipment may also be available for use on and surrounding cultural resources. One type of machine is the feller-buncher, which uses a hydraulic arm and grapple to grab trees, cut them below the grapple, lift and suspend them directly from the stump, and rotate to gently lay the tree in stacks (bunches). There are also cut-to-length logging machines that lay down a bed of protective slash in advance of the machine, which is designed for minimum ground impact. Once again care must be exercised to ensure that the vehicle, either tracked or tired, does not disturb the ground surface when they enter or exit archaeological sites.

Over-the-Snow Logging. Fuels may be safely reduced on archaeological sites in areas that receive relatively deep snowfall by removing trees over the snow. Typically, minimum snow depths and maximum temperatures are specified to ensure that the ground surface will not be impacted by logging equipment.

Burn Prescriptions. Non-exclusionary treatment measures may involve the use and manipulation of fire or fuels to attain certain temperatures, fire residence times, or other conditions (e.g., smoke limitations). Burn prescriptions may involve scheduling considerations to ensure certain fuel or air moisture; the reduction, if not elimination, of heavy fuels; application of water or other materials to keep fire temperatures within specified parameters; or applying certain firing techniques to manipulate fire residence time. Burn prescriptions should be designed and implemented by fire management specialists.

Surface Collection. Even severe fires rarely impart extensive damage to materials that are buried more than a few inches below the ground surface. Treatment of archaeological site surfaces may include the removal of cultural materials from the ground surface. Removal may involve mapping the location of artifacts, and could include temporarily collecting large artifacts prior to a fire and returning them once fire danger has passed. Alternatively, more extensive collection of fire-sensitive archaeological material (e.g., obsidian debitage) may be curated for future study, since returning such material to correct proveniences on site surfaces is impractical.

Scheduling. Scheduling a fire management activity during a season when certain critical cultural resources are less likely to be harmed is another potential treatment measure. For example, fuel management projects might be scheduled to avoid burning Native American plant resources during their productive periods. In other instances, fires may be scheduled to enhance Native American plant productivity.

Monitoring

Monitoring is a necessary element of an effective cultural resource program for fire management. Each CRE should include a discussion of monitoring procedures. Monitoring is

essential to:

- (1) Ensure that standard protective measures are effective;
- (2) Experiment with and gauge the efficacy of new techniques for protection;
- (3) Test assumptions regarding the types of resources that occur within unsurveyed areas;
- (4) Inventory areas that were visually and/or physically inaccessible prior to the fire or fuel management activity. Post-fire survey can result in inventories that yield three to five times the number of cultural resources as pre-fire surveys.

Monitoring should be addressed in the CRE as an aspect of fuels management, fire recovery and rehabilitation. Systematic observations regarding the condition of cultural resources and the nature and severity of fire effects should be recorded. Such observations may serve as the only means of monitoring the long-term effects of repeated fires on cultural resources.

7.0 MANAGING CULTURAL RESOURCES

7.1 ALTERNATIVE PLANNING PROCESSES

These workbook offer a series of planning tools within a variety of topic areas. These tools may be used selectively and in different combinations. They can be adapted, supplemented and changed to suit individual agency needs and circumstances. Given the diversity of agency lands, missions, resources, and fire management programs, no single approach to the consideration of cultural resources will satisfy all agencies' needs. Agencies that administer small land areas may have complete inventories and may understand the cultural values that are associated with each resource. One example might be a National Park consisting a few hundred acres encompassing the location of a Revolutionary War battle. An agency unit such as this may be able to develop specific prescriptions or treatment measures for all individual cultural resources within their jurisdiction, and for all foreseeable fire management activities. Agencies that administer large land areas containing many cultural resources, however, are likely to find it impractical to develop specific treatment measures for each resource under all possible fire management scenarios. It is not unusual for such agency units to have inventoried 15% or less of their lands, with little prospect of achieving comprehensive inventory in the foreseeable future.

7.1.1 Tiering the Planning Process

Under such circumstances, it may be more practical to take a tiered approach to planning that begins with general cultural resource management directions within a CRE. Management measures become more specific as agency plans for specific geographic areas evolve, and become property-specific once individual projects are identified, planned and implemented.

Agencies use different terms to describe these various planning documents, potentially leading to confusion when discussing a multi-agency PA and planning process. For example, some agencies consider a Burn Plan as the detailed implementation document for a specific prescribed fire, while other agency units consider it to be a more general, five-year template for a prescribed fire program. Such differences in definitions can lead to miscommunication regarding the level of information and planning that is needed.

This workbook considers four potential tiers or levels of documents, applicable to agency units of moderate to large size that do not and will not have comprehensive cultural resources inventories. For the purpose of this discussion, document types are defined as follows:

1. **Fire Management Plans (FMPs)**. A strategic plan that defines a program to manage wildland and prescribed fires and documents the fire management program in the approved land use plan. The plan is supplemented by operational plans such as preparedness plans, preplanned dispatch plans, prescribed fire plans, and prevention plans. FMPs describe the application of various fire management practices to those specific agency land units, taking into consideration an array of environmental concerns, including the consideration of historic properties;

2. **Cultural Resource Elements (CREs).** CREs describe the protocols that must be followed with regard to cultural resources in administering the fire program. CREs should define, based on existing information, how the agency will identify and consider important cultural resources when planning and implementing fire management activities. These protocols should take into account the fire management objectives for each FMU, which should in turn derive from the agency's land or resource management plan.
3. **Five-Year or Intermediate Project Plans.** Agencies may develop intermediate project plans that define the types, locations, and sequence of fire management projects (primarily fuels management) over a series of years, typically ranging anywhere from three to ten. These plans usually do not provide specific, on-the-ground protocols for the proposed activities, but the intermediate plans are sufficiently detailed to provide information necessary to determine the array of environmental concerns and regulatory requirements that must be addressed prior to the management activities.
4. **Prescribed Fire Plans (Burn Plan).** These documents provide the prescribed fire burn boss information needed to implement an individual prescribed fire project. It is an implementation document and regulatory requirements, such as Section 106, should have been satisfied prior to this document. However, treatment measures described in such regulatory documents are given the detail necessary for their successful implementation in the Burn Plan.

7.2 THE MATRIX

A matrix has been developed as a planning tool for summarizing cultural resource values, risks, and possible treatments. An example of the matrix is provided in Table 4. The matrix may be used to develop very specific treatment measures for known resources or, as is more often the case with CREs, the matrix may be used to identify potential inventory and management strategies for types of cultural resources.

The first column lists the historic contexts identified within the agency unit. This list could be organized by area, such as FMUs, or it could also be comprehensive and without regard to subarea. Agencies with adjacent lands and similar resources should consider collaborating on context development for shared resource types. In the Table 4 example, three historic contexts are identified; 19th century railroad logging, prehistoric stone tool procurement and manufacture, and Native American traditional plant collection. Keep in mind that the matrix is a summary of the historic context, which should be defined on the basis of themes, activities, events that transpired during a particular time in a definable geographic area. Without specific inventory information, the location of specific resources associated with historic contexts may be unknown. For example, preliminary historical research may indicate that a certain area may have been historically logged by more than one commercial logging company, yet the specific location of the archaeological resources associated with these logging activities may be only partially known. Historic context statements need not be lengthy – their purpose is to define the presence and potential importance of such resources for management purposes.

An example of a summary historic context statement for historic railroad logging within a portion of an agency's land is offered below.

Historic Context Statement for Nineteenth Century Railroad Logging

Eighteenth and early 19th century frontier expansion in the region was followed by the growth of towns, regional urban centers, and the expansion of regional industry centered on the exploitation of natural resources to support growth regional and extra-regional markets. These developments occurred roughly between 1820-1890. Chief among those exploited resources was lumber, obtained from vast, old-growth forests. Large timber companies controlled by wealthy gained control over vast tracts of forested lands for the purpose of harvesting timber. Large, old growth trees were the initial targets of timber harvest operations. Logging began with the establishment of a mill, a small settlement immediately around the mill town, and the development of logging roads and later railroad spurs from main transportation arteries up to 30 miles distant. Once the forested lands surrounding mills were depleted, additional railroad spur lines were built at increasing distances from the mills. All old-growth trees were typically taken, leaving less merchantable timber. Loggers cabins, way stations, and trash dumps developed along roads and railroads. Logging companies typically operated for a period of between 10-15 years, and were either sold or abandoned once the prime stands of timber were harvested.

Subsequent logging operations often used the facilities left by these initial logging concerns, reworking the remnant forests and taking the smaller trees to mill lumber and firewood for growing regional communities.

Nineteenth century railroad logging played a critical role in shaping the historic and contemporary landscape. Railroad systems were developed to accommodate, if not serve, logging operations, and many contemporary roads follow routes established and used by logging companies. Water conveyance systems were initially developed to power the mills and serve the mill towns. These systems were subsequently converted to other uses, and some still serve local communities. Mill towns often evolved into communities that are now supported by a variety of other industries. Logging also contributed largely to subsequent land uses. For example, vast, clear-cut tracts were later used for grazing and then agriculture. The contemporary landscape would look very different were it not for 19th century logging.

Archaeological resources associated with 19th century railroad logging have the potential to yield a wide array of information that is undocumented in written records including: the ethnicity, social rank, and lifestyle of loggers, who are virtually unrepresented in written records; the application of emerging industrial technology on a frontier landscape; the development of an early capitalist enterprise and the manner in which labor was exploited; discrimination and social interaction in closed 19th century communities; adaptation of various social and ethnic groups to resource shortages; the use and acculturation of Native Americans in early industry; and the interaction of local, regional and national economies.

Railroad logging operations are reflected in a variety of archaeological resources and landscape features including: mill remains such as foundations, chutes, and milled lumber; structural remains from mill towns such as milled lumber from collapsed buildings; domestic debris from houses; town dumps; railroad remains such as grades with and without ties, sidings, trestles, and turnstiles; way stations; log cabins and privies; isolated artifacts such as cables, gunpowder cans, and saw parts; and landscape features such as log landings, high-cut stumps, and skids.

This short context statement provides enough information to define the resources and values that may be at risk from fire management activities, as listed in Table 4.

Table 4. Historic Context Aspects of Cultural Resource Planning Matrix.

Historic Context	Resource Type	Elements	Risk Activity or Condition	Value at Risk
RR Logging	RR grade	Wood ties, berms, cuts	Fire lines, fire camps, roads & Temperature >233C°	Public Interpretation where accessible and pristine (Criterion A)
	Trestles	Milled timbers, iron hardware	Temperature >233C° Temperature >233C°	Structural engineering in frontier industry (Criteria C,D)
	Turnstiles	Milled lumber, iron hardware	Temperature >233C° Temperature >1540C°	Transportation technology Public interpretation, structural engineering in frontier industry (Criteria A, C, D)
	Log cabins	Modified logs, leather, wood, iron nails	Fire lines, fire camps, roads & Temperature >233C° Temperature >200C° Temperature >1540C°	Vernacular construction techniques (Criteria C,D)
	Way stations	Milled lumber, glass, nails	Fire lines, fire camps, roads & Temperature >233C° Temperature >500C° Temperature >1540C°	Company operations, economic interactions (Criterion D)
	Mills	Concrete, milled lumber, iron hardware	Temperature >233C° Temperature >1540C°	Industrial technology (Criterion D)
	Town structures	Milled lumber, glass, nails	Fire lines, fire camps, roads & Temperature >233C° Temperature >500C° Temperature >1540C°	Economy, social structure (Criterion D)
	Refuse Dumps	Tin, iron, glass, ceramics, bone	Fire lines, fire camps, roads, unauthorized collection & Temperature >232C° Temperature >500C° Temperature >300C°	Economy, subsistence (Criterion D)
	Isolated cans	Tin	Fire lines, fire camps, roads & Temperature >232C°	None

The temperature threshold for each element of each resource type is listed for heuristic purposes in Table 3. In practice, however, the temperature threshold for a resource type will be the lowest temperature at which any critical element will be affected, eliminating the need to “laundry-list” the affective temperatures for each element. These data have been summarized to include the minimum affective temperature for this example in Table 4.

We are also in a position to specify the methods that may be appropriate to identify such resources within the project area. The sixth column of Table 5 lists the inventory method proposed for discovering the resource type. Inventory methods will vary by agency unit, and may not include all cultural resources, depending on the nature of local cultural resources, biases of the cultural resource specialist, and the results of negotiations with the SHPO/THPO. For example, a cultural resource specialist may conclude, given fire history and the nature of the resource, that basalt flake scatters are relatively impervious to fire damage as long as there is no ground disturbance. Since the excavation of fire lines may be the only ground-disturbing

activity proposed for a prescribed fire, the cultural resource specialist may design an inventory strategy that is concerned with basalt flake scatters that occur within fire line routes, but is unconcerned about burning over such flake scatters. Whether or not individual cultural resource specialists agree on whether it is appropriate or not to burn over flake scatters is beside the point. The Fire PA allows agencies to propose inventory strategies and treatment measures that meet their management needs and affords flexibility in individual professional judgment, which may result in less than complete and intensive inventory or full protection.

The seventh column of the matrix (Table 5) lists the management objective or desired condition for the subject resource type. Total preservation may not be the management objective for all resource types in all instances. Returning to our railroad logging example, isolated gunpowder cans, log skid trails, landings, and even railroad grades all may be damaged or destroyed by fireline construction, but do these resource types and their values warrant protection? The management objective for a cultural resource may be to allow damage or destruction, or it may be to preserve selected portions or elements of a cultural resource. The management objectives may also be stated as desired conditions. For example, a prescribed fire may provide an opportunity to enhance an environment or certain resources, such as plants collected by Native Americans. The management objective or desired condition of that resource might be stated in the form of plant productivity or growth. Again, the Fire PA and the development of a CRE for each agency unit allows considerable flexibility and individual judgment to be expressed. It is important to remember that the CRE will be negotiated between the agency and SHPO/THPO, providing a crosscheck of proposed methods and management objectives.

The last column of the matrix lists treatment measures and alternatives. For many agency units, the CRE and matrix will describe the range of possible treatment measures proposed for resource types rather than finite and specific resources. The preservation interests of individual resources may not be served by a single treatment approach for any given resource type, so the matrix accommodates treatment alternatives. Accordingly, a cultural resource manager has the latitude to apply the method suited to the circumstances of individual resources while at the same time providing the public with the full range of alternatives that will be exercised when those resource types are encountered.

Table 5. Example Cultural Resources Planning Matrix for a Proposed Prescribed Fire Project

(Example provided by Rob Jackson, Pacific Legacy, Inc. / NPS Cultural Resource Protection & Fire Management Planning Lead Instructor)

¹ Historic Context	² Resource Type	⁴ Elements	⁴ Risk Conditions or Activities	⁵ Value at Risk	Inventory Method Proposed	Management Objective Desired Condition	Treatments Alternatives/Options
RR Logging	RR grade	1. Wooden ties 2. Berms, cuts	Firelines, fire camps, roads 1. Temperature > 233C	1-2. Public Interpretation where accessible and pristine (Criterion A)	1. None 2. Walk proposed fire lines if heavy equipment will be used	1. Charring of ties acceptable. 2. Maintain visible configuration.	Construct firelines at existing breaches 1. None 2. Reconstruct berms if breached.
	Trestles	3. Milled Timbers 4. Iron Hardware	Firelines, fire camps, roads 3. Temperature > 233C	Structural Engineering in frontier industry (Criteria C, D)	3-4. Identify drainages from topographic map and spot-check in field	Passive preservation of trestle remains.	3-4. Avoid placing firelines, camps, roads at location of trestle. Foam or hand remove veg. surrounding trestle
	Turnstiles	5. Milled Lumber 6. Iron Hardware	Firelines, fire camps, roads 5. Temperature > 233C	Transportation technology, (Criteria A,C,D)	Spot check mill area and ends of RR	Passive preservation of turnstile. Interpret remains for public.	5-6. Avoid firelines, fire camps, roads at location. Hand remove fuels w/ 10 meters of remains or foam turnstile
	Standing Log Cabins	7. Modified Logs 8. Leather, wood 9. Iron nails	Firelines, fire camps, roads 7. Temperature > 233C 8. Temperature > 233C 9. Temperature > 1540C	7. Vernacular construction techniques, (Criteria C,D)	7. Field Inventory at 50 meter intervals within 200 meters of RR grade 8. Leather, wood associated with cabin	7-8. Active preservation of cabin and associated leather & wood.	Avoid firelines and roads at location. 7-8. Hand remove natural woody fuels within 30 meters of cabin, or wrap cabin. 9. Iron nails not at risk - no treatment

Table 5.
Cont.

RR Logging	Waystations	10. Milled Lumber 11. Glass 12. Nails	Firelines, fire camps, roads 10. Temperature > 233C 11. Fracture and melting >500C 12. Temperature > 1540C	Company operations, economic interactions, (Criterion C,D)	10. Field Inventory at 30 meter intervals within 200 meters of RR grade. Downed structures require tighter transect. 11-12. Glass and other will be associated with lumber.	10-12. Preserve configuration of archaeological deposit.	Avoid firelines and roads at location. 10-12. Use fire line to prevent site burn over.
	Mills	13. Concrete 14. Milled Lumber 15. Iron Hardware	Firelines, fire camps, roads 14. Temperature > 233C 15. No risk to iron hardware (<1540C).	Industrial Technology (Criterion D)	13-15. Field check location documented in historic literature. Otherwise, mills will be found while looking for cabins	13-15. Maintain integrity of foundation and associated remains.	Avoid firelines and roads at location. 13-14. Hand remove natural fuels within 30 meters of mill remains.
	Town Structures	16. Milled Lumber 17. Glass 18. Nails	Firelines, fire camps, roads 16. Temperature > 233C 17. Temperature > 500C.	Economy, social structure (Criterion D)	Field check location documented in historic literature. Otherwise, towns will be found while looking for cabins	16-18. Maintain integrity of foundation and associated remains.	Avoid firelines and roads at location. 16-18. Hand remove natural fuels within 30 meters of mill remains.
	Refuse Dumps	19. Tin, iron 20. Glass, ceramics 21. Bone	Firelines, fire camps, roads Temperature > 1540C Pothunting Temperature > 233C	19. Little risk from fire. Economic substinence (Criterion D)	Survey at 15 meter intervals within 200 meters of identified buildings and RR grade	Passive preservation of dump.	
	Isolated Cans	22. Iron ("tin" cans)	Temperature > 1540C	None	No survey recommended	Passive preservation	No treatment necessary

Table 5.
Cont.

Prehistoric Stone Tool Manufacture	Basalt	1. Outcrops	1-2. Firelines, fire camps, roads	1. Heavy equipment damage	1. Walk proposed fire lines, especially if heavy equipment will be used	1-2. Passive preservation	1-2. Reroute fire lines, camps, roads
Prehistoric Plant Processing	Surface	1. Bedrock Mortars	Firelines, fire camps, roads	1. Boulder outcrops with heavy fuels	1. Inventory fuels around base of boulders.	1. Keep groundstone from fracture.	1-3 Remove woody fuels immediately surrounding groundstone features, to distance of 20 meters.
	Milling Features	2. Grinding surfaces		2. Heavy Equipment damage	2. Walk proposed fire lines, especially if heavy equipment will be used	2-3. Protect potential residue.	
	& Artifacts	3. Hand stones		3. Heavy Equipment damage	3. Walk proposed fire lines, especially if heavy equipment will be used		

1 Historic contexts are the themes, activities, events, or time periods that are represented by cultural resources.

2 Resource types are categories of physical objects or properties that share common attributes, elements, and usually functions.

3 Elements are the basic building blocks or constituents that make up resources.

4 Risk Conditions or Activities are the project actions that could damage elements of resource types.

5 Values at Risk are those cultural values

